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Draft Evaluation of the Need for Change

Revision to the George Washington Revised Land Management Plan

George Washington and Jefferson National Forests
Roanoke, Virginia



Tiger Salamander: Photo: USFS

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CHAPTER 1. INTRODUCTION

Purpose of Report

The Forest Service prepared this Evaluation of the Need for Change to (1) evaluate the current conditions of ecological, social, and economic sustainability on the national forest; (2) analyze trends that may influence progress toward desired conditions; and (3) determine any needed changes in plan direction.

Background of the Forest Plan

The first Land and Resource Management Plan (Forest Plan) for the George Washington National Forest was completed in 1985 and was revised in 1993. After almost 15 years implementing the revised Forest Plan, it is time to revise and update it to incorporate new information, changed national direction and priorities, and to address new issues. Furthermore, NFMA requires Forest Plans to be revised every 15 years.

The Forest Plan provides a strategic vision for 10 to 15 years. It establishes the desired conditions to be achieved through the management of National Forest System lands to best meet the needs of the American people. The plan blends national and regional priorities with local Forest capabilities and needs. It provides a vision of how the George Washington National Forest fits within a broader landscape and community context.

Analysis Area

The George Washington National Forest extends for 140 miles along the Appalachian Mountains of northwestern Virginia and adjacent West Virginia. The Forest includes approximately 960,000 acres of National Forest System lands in 13 Virginia counties and approximately 105,000 acres in four counties in West Virginia – a total of 1,065,000 acres. These counties include: Alleghany, Amherst, Augusta, Bath, Botetourt, Frederick, Highland, Nelson, Page, Rockbridge, Rockingham, Shenandoah and Warren counties, Virginia and Hampshire, Hardy, Monroe and Pendleton counties, West Virginia.



Vicinity Map

CHAPTER 2. MAJOR CHANGES SINCE THE 1993 REVISED FOREST PLAN

Introduction

This chapter describes new laws, regulations, policy or emerging issues and how they may affect direction in the 1993 Revised Forest Plan.

Forest Service Strategic Plan

Many decisions are made on the ground, at the district level, where site-specific conditions can best be considered. Yet, from the time of Gifford Pinchot, the Forest Service has also had an agency-wide common strategic direction. The agency captures that direction through its [Strategic Plan](#) and its periodic updates. The current USDA Forest Service Strategic Plan is for fiscal years 2007-2012. The Strategic Plan defines the Forest Service mission: “Sustain the health, diversity, and productivity of the Nation’s forests and grasslands to meet the needs of present and future generations.” The Strategic Plan also identifies four major threats to the Nation’s forests and grasslands:

- 1) growing fire danger due to hazardous fuel buildups;
- 2) the spread of invasive species;
- 3) loss of open space; and

- 4) unmanaged recreation, particularly the unmanaged use of off highway vehicles.

The Strategic Plan identifies several management principles that are relevant to the revision of the Forest Plan, including:

1. Sustaining the Nation's natural resources by reducing the four major threats; restoring structural characteristics, native species and ecological processes often through active management; and adapting management strategies to help mitigate the effects of climate change.
2. Valuing ecosystem services, which are goods and services that we derive from the forest that are often not valued in the marketplace, such as air and water purification, flood and climate regulation, biodiversity, and scenic landscapes.
3. Working with partners to expand the knowledge and resources need to fulfill the mission of the Forest Service.

Yet, what ultimately counts is what happens on the ground. When the George Washington National Forest executes its existing budget, local managers plan their project-level work to maximize their contributions to the agency's strategic goals above. We use our local Forest Plan and our knowledge of the land to guide us in our endeavor to achieve or contribute to these agency-wide goals. Success in accomplishing our annual work program also depends partly on finding new ways of doing business, including community-based solutions, new ways to work in partnership with governmental and nongovernmental organizations, and procedural reforms.

This nationwide strategic plan shows the short-term priorities of the agency. However, the Revised Forest Plan not only provides some short-term priorities, but long-term desired conditions. Given the long-term Plan direction, the agency's Strategic Plan does not drive a forest plan revision. This nationwide plan helps trigger thought on how these nationwide goals are pertinent to the George Washington and the degree to which the Forest Plan can contribute to this nationwide strategy.

Region 8 Strategic Framework

The Region 8 Strategic Framework helps to focus on priority work in the Region. The framework is intended to guide each Forest's work to support the region's shared vision. The framework is a living document that will evolve over time to respond to a changing world and serve as an anchor during those times of change. There are three focus areas (Restore, Protect, and Respond) with objectives for each focus area.

Area of Focus 1: Restore

Goal: Ecological systems are returned to their natural resilience and sustained.

Objectives:

1. Condition of watersheds is improved.
2. Native vegetation identified in Forest or state plans is restored.
3. Rare species are restored.

Area of Focus 2: Protect

Goal: Human, natural, cultural, and physical resources are secure from degradation and harm.

Objectives:

1. People and resources are protected from catastrophic wildfires.
2. The basic structure, function, and resilience of ecosystems are protected.
3. People and resources are protected from unmanaged and/or unlawful activities.
4. Private inholdings and lands adjacent to forests and grasslands are not threatened by fragmentation.

Area of Focus 3: Respond

Goal: Social needs are met in an environmentally sensitive manner.

Objectives:

1. Biomass availability is emphasized to respond to anticipated needs and demands.
2. Administrative facilities and managed outdoor recreation opportunities are environmentally sustainable.
3. Special Uses are managed to minimize the environmental footprint through compliance with terms and conditions.

Forests Consolidation

In 1995 the George Washington and Jefferson National Forests were administratively combined. The two Forests continue to have separate Forest Plans.

The Jefferson Forest Plan was revised in 2004 and provides direction for 723,300 acres in Virginia, West Virginia and a small portion of Kentucky. That revision process was conducted in conjunction with the revision of Forest plans on four other Appalachian Forests and followed the Southern Appalachian Assessment. A strong effort was made to incorporate the best available science in these revisions. We would like to take advantage of this information in the revision of the George Washington Forest Plan. In addition, we would like to have the George Washington Forest Plan be more similar to the plan on the Jefferson to make management of the two Forests more compatible and easier to understand.

Southern Appalachians Assessment

The Southern Appalachian Assessment (SAA) was a broad scale assessment of conditions and trends completed in 1996 to facilitate the revisions of the Forest Plans for the Jefferson, Nantahala-Pisgah, Cherokee, Chattahoochee, and parts of the Sumter and Talladega National Forests. It also involves the National Park Service lands in the Great Smoky Mountains National Park, Shenandoah National Park, and Blue Ridge Parkway. The SAA facilitated an interagency ecological approach to assessing conditions in the Southern Appalachian area by collecting and analyzing broad-scale biological, physical, and socioeconomic data to facilitate better, more ecologically based, forest-level resource analysis and management decisions. The SAA culminated in a final summary report and four technical reports. The SAA is organized around four themes: (1) Terrestrial (including Forest Health and Plant and Animal Resources); (2) Aquatic Resources; (3) Atmospheric Resources; and (4) Social/Cultural/Economic Resources (which includes the Human Dimension, Roadless Areas and Wilderness, Recreation, and Timber Supply and Demand). The SAA supported the revision of the Forest Plans by describing how the

lands, resources, people, and management of the national forests interrelate within the larger context of the Southern Appalachian area.

The SAA also covered the lands of the George Washington National Forest and information in the SAA will help inform the development of plan components for the revised plan.

CHAPTER 3. ECOLOGICAL CONDITIONS AND TRENDS

Introduction

The 1993 Revision of the GW Plan focused on a number of significant issues. These issues were developed through an extensive public involvement effort. The issues were used to: 1) develop the environmental analysis; 2) evaluate the alternatives considered; and 3) help define the desired condition of the Forest. Due to the importance of the issues in defining the current George Washington Forest Plan, the issues were used as a starting point to evaluate how well the plan has been implemented and where changes may be needed. New issues, information from our public collaborative efforts and additional analysis of science were used to refine and expand the issues.

Issue Biodiversity

A major goal of the 1993 Revised Forest Plan was to maintain biological diversity on the Forest (Plan page 2-1). Within that the following factors were, at that time, important to the discussion. A discussion of these factors follows.

A. Fragmentation (Successional Habitat)

1. What was the Plan Striving For?

The Forest Plan strove to balance the need for unfragmented forests with the need to create early successional forests under the premise that "unfragmented" dealt with both permanent and temporary changes to the landscape. Science has evolved since 1993 (Franklin 2002) and one of the Chief's threats deals with loss of forests. Today, it is this concept that better defines "fragmentation" as associated with permanent loss of forests rather than temporary change within a forest as they are managed silviculturally.

Our approach to fragmentation took into account that all ecosystems on the Forest were and are dynamically affected by natural and man-made forces and that no natural community or habitat condition is considered never changing.

The Forest Plan (Pages 2-2 and 2-3) sought to:

- 1) Provide large, unfragmented blocks of forested land, mostly in later successional stages. These areas were allocated primarily to Management Areas 4, 5, 6, 8, 9, 18, 21 and portions of Management Areas 13, 14 and 15 that were unsuitable for timber production. These areas were located in a manner that provided opportunities for the movement of plants and animals.
- 2) Provide habitat for species benefiting from early successional vegetation. Early successional habitat was provided in Management Areas 12, 16, 17, 20, 22 and portions of Management Areas 7, 11, 13, 14 and 15 which were suitable for timber production. Basically, this early successional habitat was to be located in timber harvest

units (0-10 age class), wildlife clearings, utility rights-of-way, and in some prescribed burn areas.

2. Where is the Plan Now?

Forest Interior Habitat

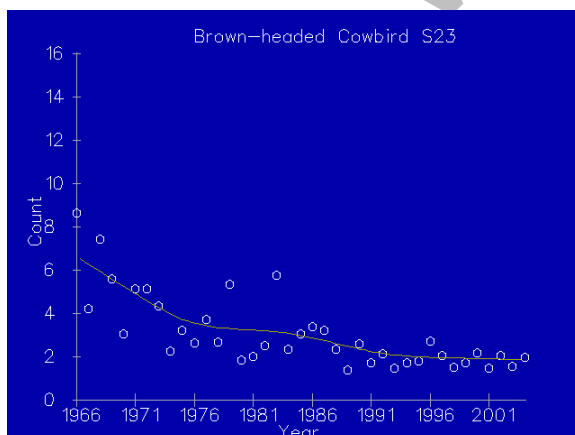
Before discussing the existing plan, we would like to also put the term "fragmentation" into context. Forest fragmentation is a function of patch size, isolation of patches, total reserve area, and linkages among patches. Patch size and age requirements vary by species. Many species tolerate or prefer a mixture of forest age classes, but some species are restricted to young (early successional) or mature (late successional) forest communities only.

The Management Areas designated to provide large blocks of relatively unfragmented forested areas have not changed. Three Management Indicator Species (MIS) were selected to monitor this facet of overall diversity: the brown-headed cowbird, the ovenbird, and the worm-eating warbler. Information on MIS is summarized in Appendix G of the *George Washington and Jefferson Detailed Monitoring and Evaluation Report for Fiscal Year 2004*.

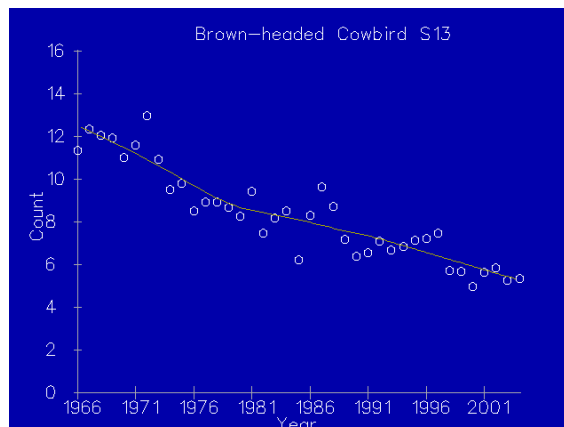
The brown-headed cowbird (*Molothrus ater*) was selected as a MIS to represent possible effects of fragmentation across the landscape (GWNF FEIS, page J-10). This species inhabits open agricultural lands, but will fly into nearby forested areas to lay their eggs in other bird's nests (nest parasite), and is considered an indicator of edge habitat effects (GWNF FEIS, page 3-172). Population trends for this MIS were documented in the Forest Service's past monitoring and evaluation reports.

Currently, the United States Geologic Service's (USGS) [Breeding Bird Survey \(BBS\) data](http://www.mbr-pwrc.usgs.gov/bbs/bbs.html) (Sauer, J. R., J. E. Hines, and J. Fallon. 2008. The North American Breeding Bird Survey, Results and Analysis 1966 – 2007) Version 5.15.2008. USGS Patuxent Wildlife Research Center, Laurel, MD indicates a steady downward trend in brown-headed cowbird numbers in Virginia and in the Blue Ridge Mountain and Northern Ridge and Valley Sections of Virginia.

Trend in BBS Data of Brown-Headed Cowbirds across the Blue Ridge and Ridge and Valley regions, 1966 To 2005. Source: <http://www.mbr-pwrc.usgs.gov/bbs/bbs.html>



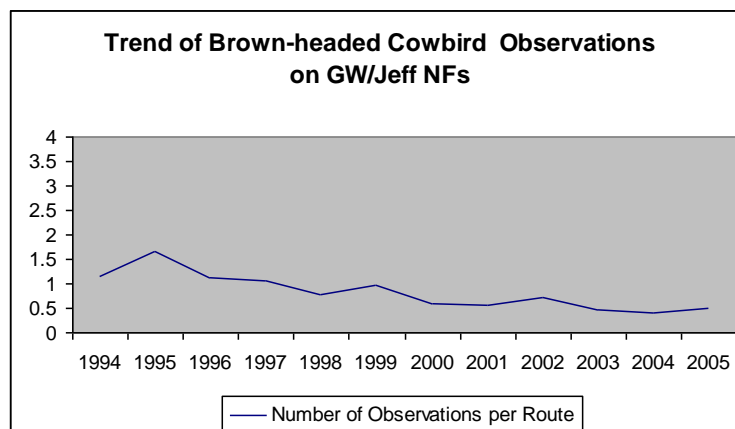
Blue Ridge Physiographic Region



Ridge and Valley Physiographic Region

Data from GWJNF's avian points for the brown-headed cowbird indicates an overall decreasing trend on the GWJNF's.

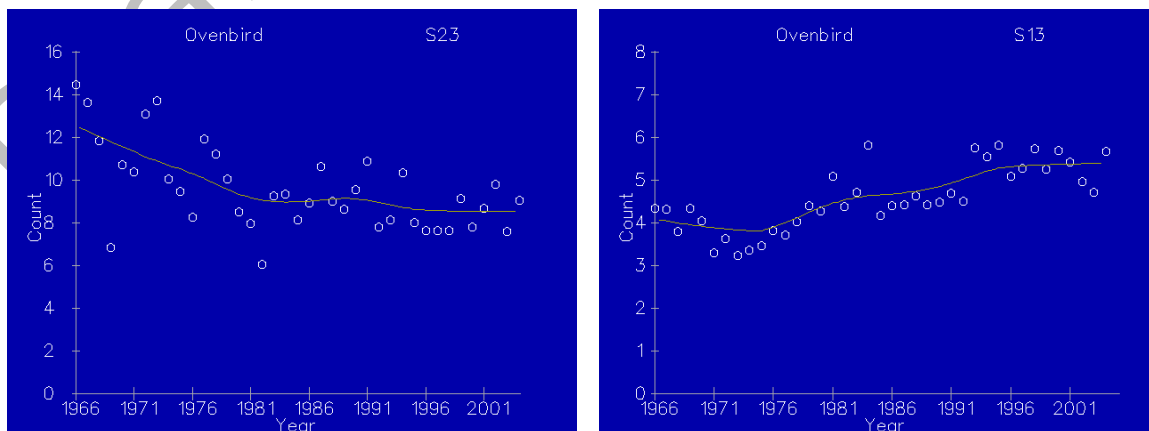
Trend in GWJNF Data of Brown-Headed Cowbirds across GWJNF, 1994 to 2005



The relatively low numbers documented by point count data and steady downward trend by BBS data, suggests the minimal amount of forest fragmentation (both existing and that created by management activities) across the George Washington is not sufficient to support significant populations of cowbirds. Additionally, patch size of interior forest on the George Washington appears not be readily penetrated by cowbirds searching for nests to parasitize. Overall, viability of this species in the area surrounding the GWJNF is not in question. NFS land likely contributes marginally to area populations. Those birds found on NFS land are primarily composed of birds coming from surrounding private agricultural land in search of nest parasitism opportunities. Cowbird occurrences are expected to continue to decrease in the near future as the landscape becomes more forested.

In addition, Ovenbird (*Seiurus aurocapillus*) and Worm-eating warbler (*Helminthos vermivorus*) were selected because trends in presence and abundance of these species in mature deciduous forests will be used to help indicate the effectiveness of management in maintaining desired condition relative to forest interior habitats (GWNF FEIS, page J-12). USGS Breeding Bird Survey data indicates increasing trends in populations of ovenbirds and worm-eating warblers statewide, and stable to increasing trends in the Blue Ridge Mountain and Northern Ridge and Valley regions. Avian point count data from the GWJNF's for ovenbird and worm-eating warbler also indicates an overall stable to increasing population trend.

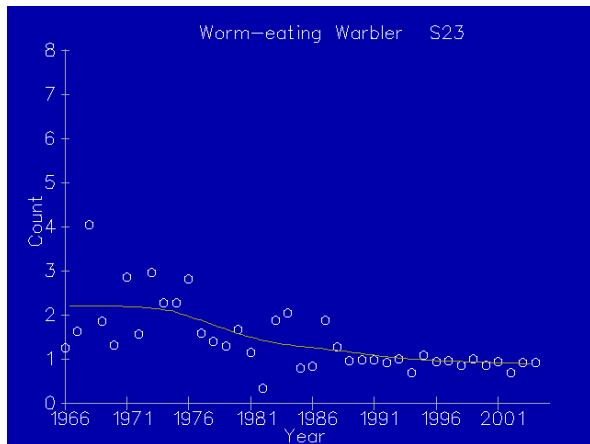
Trend in BBS Data of Ovenbirds across the Blue Ridge and Ridge and Valley regions, 1966 To 2005. Source: <http://www.mbr-pwrc.usgs.gov/bbs/bbs.html>



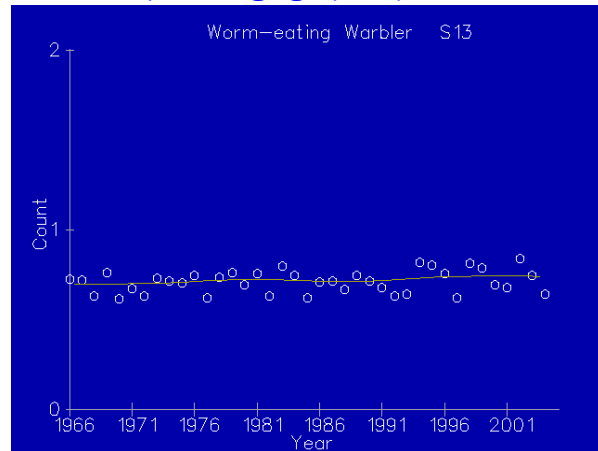
Blue Ridge Physiographic Region

Ridge and Valley Physiographic Region

Trend in BBS Data of Worm-eating Warblers across the Blue Ridge and Ridge and Valley regions, 1966 To 2005. Source: <http://www.mbr-pwrc.usgs.gov/bbs/bbs.html>

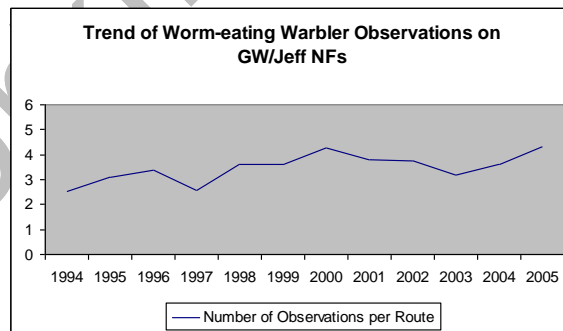
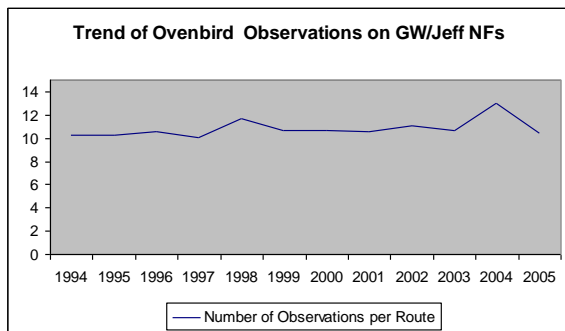


Blue Ridge Physiographic Region



Ridge and Valley Physiographic Region

Trend in GWJNF Point Count Data of Ovenbirds and Worm-eating warblers across GWJNF, 1994 To 2005

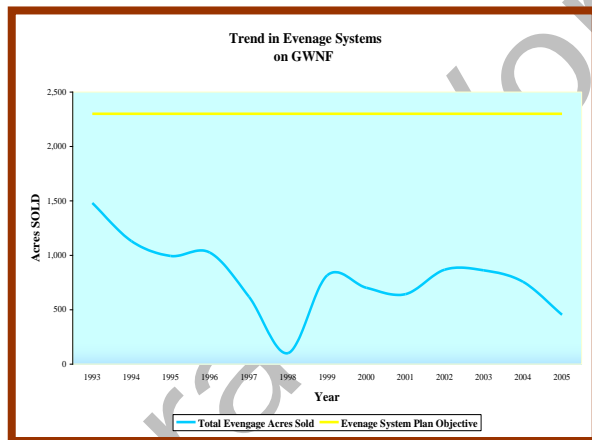


Ovenbirds breed in upland deciduous or mixed deciduous/pine forests with a moderately dense understory. They nest on the ground and build a covered nest from leaf litter. Worm-eating warblers also prefer deciduous or deciduous/pine forests to breed, but they require a denser, evergreen understory. They also nest on the ground in the leaf litter. Both require large patches of mature forest for nesting. While the need for large patches of mature forested habitat has been well documented for many migratory bird species, including ovenbirds and worm-eating warblers, evidence is mounting that early successional woody habitats are also important for these same species during the critical time period just after breeding and during migration (Bulluck and Buehler 2006). These areas provide 'safe havens' for adult and fledgling ovenbirds and worm-eating warblers for the following needs: molting, abundant food for the buildup of fat reserves for migration, and protection from predators. Studies strongly recommend conservation strategies that maintain large tracts of mature forest, within which there is a mosaic of different forest types and ages (early and mid-successional forest stands), to provide the habitat requirements needed by migratory birds such as ovenbirds and worm-eating warbler.

during all of their life stages here in North America. Based on the current age-class structure of forested land in the GWNF's, 88% of all forest types are mature (71-150+ years). Timber management on the since 1993 has declined from about 3,000 acres per year to about 800. Conversely, prescribed fire has increased from about 1,000 acres per year to about 7,000. Timber management and some prescribed fire, in addition to natural disturbances and continued maturation of the forest, provide patches of early successional woody habitat, as well as restoring and maintaining open oak, oak/pine, and pine woodlands. Combined with the maintenance of over 80% of forested acres in mature forest condition, the George Washington should be able to provide the mosaic of forest types and ages recommended by research for migratory birds such as ovenbirds and worm-eating warblers during the life history stages (breeding, post-breeding, migration) that they utilize GW lands. Based on the results of monitoring data and habitat evaluation, these two species exhibit stable to increasing population trends on the GW, as well as state-wide and region-wide, and have the abundance and distribution across the Forest that will provide for their persistence into the foreseeable future.

Early Successional Habitat

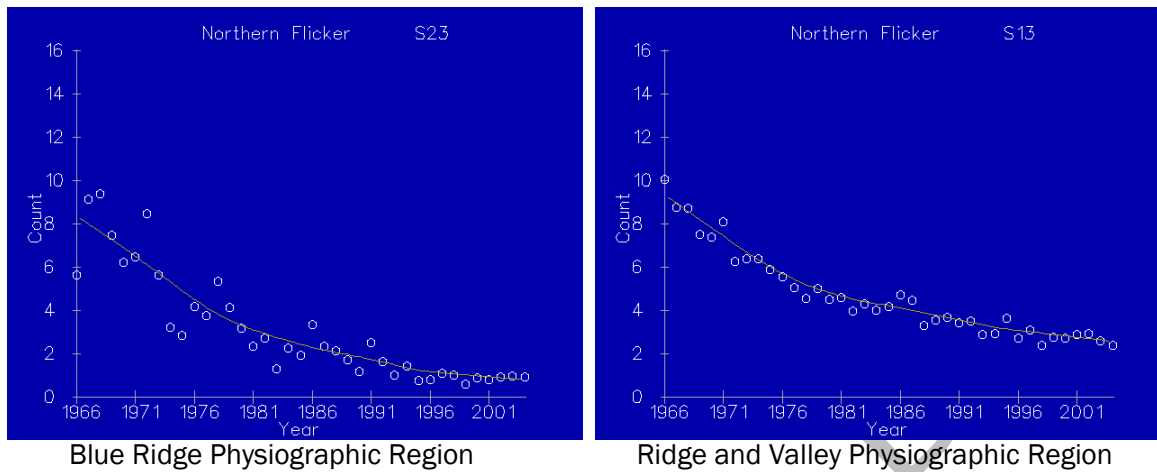
The Management Areas designated to provide patches of early successional habitat have not changed since the advent of the GW revised forest plan. Permanent early successional habitat in the form of open land, field, and old farm habitat has stayed relatively stable in Management Areas 10, 22, and developed recreation areas in Management Area 12. Utility corridors are also relatively stable grassy/shrubby habitat. Since 1993, prescribed fire has increased from about



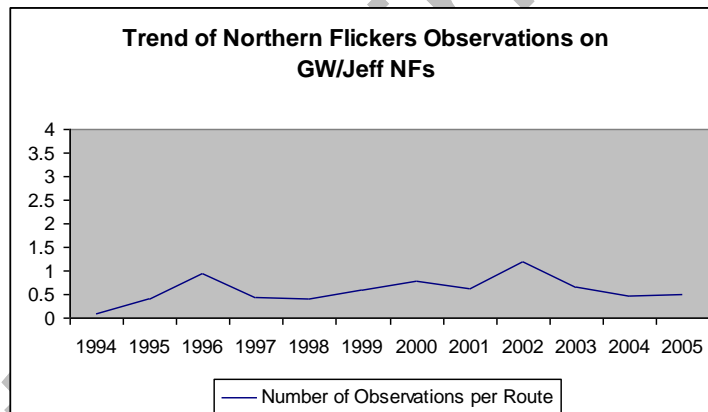
1,000 acres to over 7,000 acres/year, creating, within a forested landscape, more open woodland habitat and some patches of early successional habitat (i.e. south and southwest facing slopes where hot fires helped open serotinous cones to regenerate such species as table mountain pine). Likewise, timber harvesting has also provided early successional habitat (See adjacent Even-aged Timber management graph), even though acreage treated has decreased from about 3,000 acres per year in 1993 to about 800 (see also section on Vegetation Management).

The northern (common) flicker (*Colaptes auratus*) was selected as a MIS to represent effects of management on cavity nesters for the GWNF (GWNF FEIS, Appendix page J-12), but is also an indicator of open woodland habitat (both deciduous and coniferous). USGS Breeding Bird Survey (BBS) data indicates a steady decline from 1966 to the mid 1990s, followed by a low but more stable trend for the last 10 years in some regions. Data from GWJNF's avian points has been collected since 1994 and generally mirrors the trend for the last 10 years of BBS data for northern flickers, indicating a low and variable, but overall stable trend on the GWJNF's.

Trend in BBS Data of Northern flickers across Blue Ridge and Ridge and Valley Physiographic Regions, 1966 To 2005. Source: <http://www.mbr-pwrc.usgs.gov/bbs/bbs.html>



Trend in GWJNF Data of Northern Flickers across GWJNF, 1994 to 2005



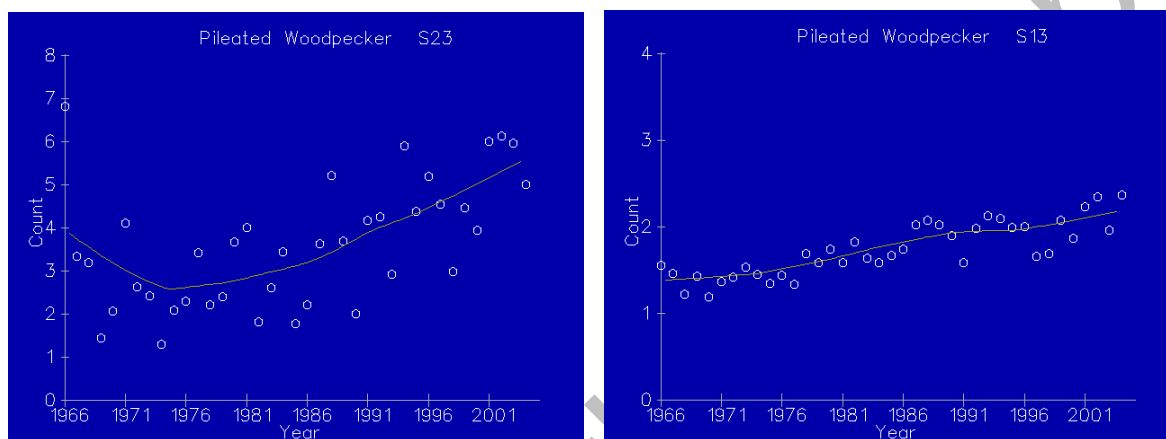
Northern flickers prefer open woodland habitat and ecotone habitat between forested and patches of early successional woody or grassy/shrubby habitat. It requires large-sized (over 12" DBH) snags and living trees for excavating nest cavities. Based on the current age-class structure of forested land in the GWNF's, 88% of all forest types are mature (71-150+ years). Timber management and some prescribed fire, in addition to natural disturbances and continued maturation of the forest, should provide the following habitat requirements for northern flickers: large-sized snags and living trees for nest cavities, patches of early successional woody habitat, and some restoration /maintenance of open oak, oak/pine, and pine woodlands. However, the steep declining trends shown by USGS BBS data in populations of northern flicker across the larger regions of the Blue Ridge Mountains and Ridge and Valley Regions, which are year-round residents, indicates a marked decrease in the type of habitat they rely upon, especially open woodland habitat and the ecotone habitat between forested and patches of early successional woody or grassy/shrubby habitat. An increase in management

activities such as prescribed fire and timber management is needed to restore open woodland habitat and create early successional habitat.

Snag Habitat

The pileated woodpecker (*Dryocopus pileatus*) was selected as a MIS because trends in presence and abundance of this species across the forest will help indicate the effectiveness of management in maintaining desired conditions relative to abundance of snags (GWNF FEIS, Appendix page J-12). USGS BBS data indicates an increasing population trend of pileated woodpeckers statewide, as well as in the Blue Ridge Mountain and Northern Ridge and Valley regions. Data from the GWJNF Point Counts indicated an overall stable population trend for pileated woodpeckers on the GWJNF.

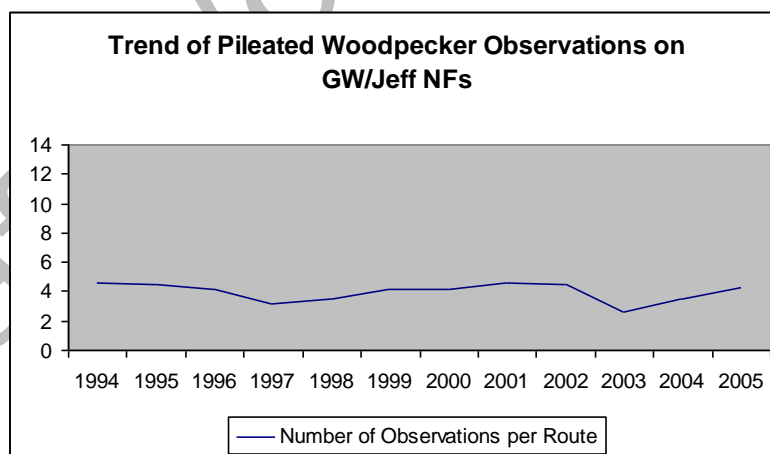
Trend in BBS Data of Pileated Woodpeckers across the Blue Ridge and Ridge and Valley regions, 1966 To 2005. Source: <http://www.mbr-pwrc.usgs.gov/bbs/bbs.html>



Blue Ridge Physiographic Region

Ridge and Valley Physiographic Region

Trend in GWJNF Data of Pileated Woodpeckers across GWJNF, 1994 to 2005



Pileated woodpeckers generally prefer mature forests near riparian areas. This species is a primary cavity nester/excavator, requiring large snags for nesting cavities and large dead trees for feeding. Generally, this species requires trees greater than 15 inches DBH for cavities, but prefers trees greater than 20 inches DBH. Based on the current age-class structure of forested land in the GWNF's, 88% of all forest types are mature (71-150+ years). Based on the results of monitoring data and habitat evaluation, this species is showing stable population trends on the GWJNF's and increasing trends both statewide

and across the Blue Ridge Mountain and Ridge and Valley Regions. Pileated woodpeckers have the abundance and distribution across the Forest that will provide for its persistence into the foreseeable future.

3. Did Management Activities Move the Forest towards the Desired Future condition?

For forest interior habitat, management activities did move the forest towards the desired future condition. For early successional habitat, management activities did move the forest towards the desired future condition, but did not meet certain objectives stated in management areas related to early successional habitat.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? Since the 1993 revised GW forest plan, scientific understanding of fragmentation in general and the effects of fragmentation on various wildlife species has changed (see Final Environmental Impact Statement for the 2004 Revised Jefferson National Forest Land and Resource Management Plan, pp. 3-121 through 3-123). In addition, as described in the sections on MIS such as northern flickers, yellow pine and white-tailed deer, open woodland habitat and early successional habitat have declined across the GWNF. Open woodland restoration has been identified as a need for change in other sections (see MIS, Endangered species, and fire sections). Open woodland habitat contains large patches of mature trees, and is classified as mature in the overall age-class structure tables, yet provides an understory of native grasses and shrubs that can be maintained as a stable component of this forest type. Historically created and maintained with disturbance regimes such as prescribed fire and timber treatments, open oak woodland restoration can provide habitat required by many species at some point in their yearly life cycle needs, including white-tailed deer, ruffed grouse, black bear, wild turkeys, Indiana bats, golden-winged warblers, and many 'forest interior' bird species during critical post-breeding, migratory, and wintering life cycles (Buehler 2007, Bulluck 2006, VDGIF 2005, WVDNR 2005, Natureserve 2009).

c. Tentative Options or Proposed Actions for Change

C-1. Add an objective for open woodland restoration.

5. What are the Consequences of Not Changing?

We would not be using best available science. Open woodlands were historically present across the GWNF and have declined dramatically since the turn of the century, mainly due to fire suppression. Characterized by an open mature tree canopy and a stable understory of native grasses, forbs and shrubs, larger patches of open woodlands are needed to provide habitat needs for an increasing number of species that are declining in population, or are already rare and/or endangered across the forest.

By not providing for open woodland restoration, the plan would not be able to provide an important habitat component for these species. Interior, unfragmented habitat would continue to be provided to support those species that need it. Open woodland habitat and early

successional habitat would continue to decrease and contribute to a continuing downward trend in the northern (common) flicker.

6. Recommendations for Plan Revision

Concern about maintaining early successional habitat and large blocks of mature forest with limited canopy breaks continue to be expressed. The SAA identified that it is expected that, over the next 15 years, suitable acreage in large tract sizes and associated forest interior habitats will continue to decrease, primarily on private lands.

The large blocks identified in the 1993 Plan should continue to have desired conditions emphasizing mature vegetation and late successional stages. However, this desired condition should be expanded to include the need for open canopy late successional stages developed through the reestablishment of a fire regime that results in patches of open woodland.

There is a need to maintain desired conditions for early successional habitat distributed throughout much of the Forest. The maintenance and reestablishment of early successional habitat is an area where the Forest has made little progress towards the desired condition. Both the Virginia Department of Game and Inland Fisheries and the West Virginia Division of Natural Resources have requested that the Forest increase the amount of early successional habitat on the Forest. While some people have suggested that private land can provide early successional habitat, the Forest has a responsibility to provide for diversity of plant and animal communities. This diversity includes those species that depend on, or use, early successional habitat. This includes species such as the golden-winged warbler that depends upon shrubland habitat and whose populations have been in decline. The American Bird Conservancy recently identified early successional habitat in deciduous forests as one of their top twenty most endangered habitats in the country.

To improve progress towards the desired condition for early successional habitat, objectives for prescribed fire should be identified in addition to timber harvest. Three types of early successional habitat need to be identified in objectives: grass/forb openings; old fields; and temporary openings that will grow back into forested communities. In addition, objectives should be established for open woodlands. Open woodlands provide aspects of both mature forests and forest openings.

B. Old Growth

1. What was the Plan Striving For?

Old growth and late successional forests were considered as a component of biodiversity in the Plan. To avoid foregoing opportunities for existing or developing old growth, the Plan prohibited scheduling silvicultural practices on lands classified as unsuitable for timber management in any of the ten old growth forest type groups that occur on the Forest (Plan page 2-4). Additionally, the Plan prohibited regeneration harvest practices on lands classified as suitable for timber production in 9 of the 10 old growth forest type groups (OGFTs) (all groups except the Dry-mesic Oak Forest Group #21) (Forest Plan page 2-6.) For the Dry-Mesic Oak Forest group,

stands proposed for silvicultural activities were to be inventoried, and the stands old growth characteristics, if any, were to be discussed in the site-specific analysis (Plan page 2-6.)

Overall, acreage of old growth forest types on the GWNF is increasing as the forest continues to increase in age. Old growth acreages of each forest type are expected to continue to steadily increase over time.

2. Where is the Plan Now?

Fundamentally, little true old growth exists on the GWJNF. The main reason the GW and Jeff exist today is because these lands were "The Lands Nobody Wanted" (Shands1992) They had been farmed, grazed, used to provide fuel for the iron industry, and to provide bark for tanneries during the 1800s. Thus, most of this land had been harvested at least one time. Almost all of the lands were acquired from private and business owners.

The amount and distribution of old growth forests on the GW is most influenced by management activities associated with timber harvesting. Natural disturbances, such as strong winds, large accumulations of ice, native insects (gypsy moths) and disease, fire (wildland and prescribed), and landslides, also affect old growth forest conditions, but they are regarded as being within the natural range of variability for forest successional dynamics. No plant or animal species in the Appalachians are known to require old growth forest conditions exclusively (i.e. are "old growth obligates") for their survival or continued existence (NatureServe, VDGIF 2005, WVDNR 2005, VDCR-NH). Mature or late seral forests are considered to be those forests that are in the later stages of succession and are generally synonymous with old growth. Old growth forests are distinguished by not only old-age trees but also related structural attributes within the forest stand. The age at which a stand develops old growth attributes varies according to forest type (determined by dominant tree species) and reflects climate, site conditions (bedrock geology, soil type, aspect, moisture regime, elevation), and disturbance regime. A discussion on old growth as it relates to the GWNF is found in Revised Plan pages 2-3 to 2-6. Additional information is contained in the document, *"Guidance for Conserving and Restoring Old-Growth Forest Communities on National Forests in the Southern Region, Forestry Report R8-FR 62"* and *"Information about Old Growth for Selected Forest Type Groups in the Eastern United States, General Technical Report NC-197."*

Prior to scheduling any silvicultural practices on lands classified as suitable for timber production in Old Growth Forest Type Group (OGFT) 21 (dry-mesic oak forests), stands were inventoried by the criteria listed in Appendix H of the FEIS, and after 1997, were inventoried using the Southern Region's Guidance (Forestry Report R8-FR 62). Silvicultural practices could proceed after site-specific analysis and disclosure which included a discussion on the old growth characteristics found in the stand(s) of the project area, the effect of the action on these characteristics, and the effect the action would have on the contribution of the area to the Forest's "old growth" inventory (Forest Plan pages 2-3 to 2-6.)

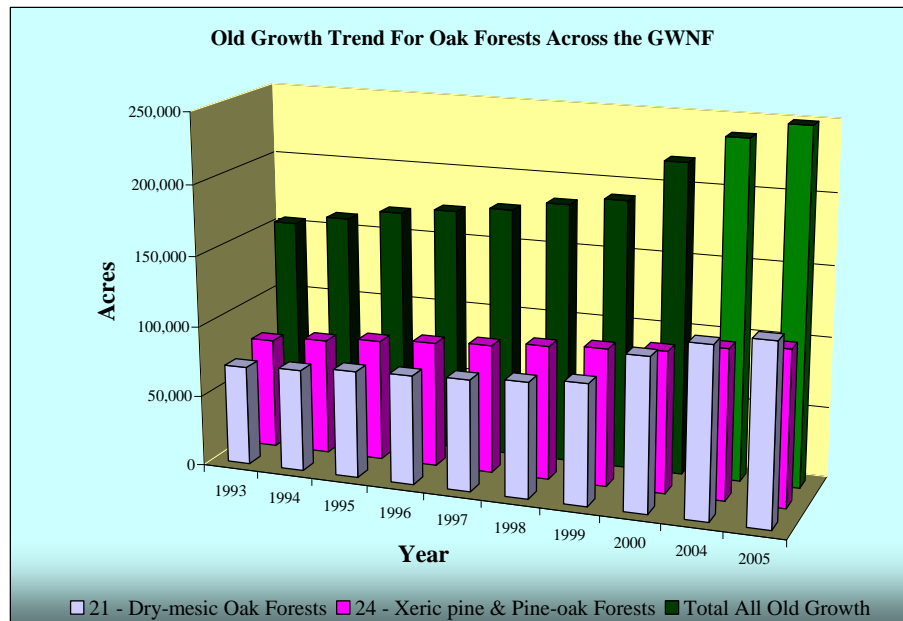
Old growth forests were selected as a management indicator in the GWNF Revised Plan because late successional forest conditions are an important element of plant and animal habitat diversity and "old growth" is a social issue. These late successional (i.e. "mature") forest conditions are biological communities (GWNF FEIS, page J-12). There are ten old growth forest type groups on the GWNF. They consist of: 1) northern hardwood forests, 2) conifer (hemlock, white pine, red spruce) and northern hardwood forests, 3) mixed mesophytic forests, 4) hardwood wetland forests, 5) dry-mesic oak forests, 6) dry and xeric oak woodlands and

savannas, 7) xeric pine and pine-oak forests and woodlands, 8) dry and dry-mesic oak-pine forests, 9) eastern riverfront forests, and 10) rocky, thin-soiled excessively drained cedar woodlands. These groups represent aggregations of similar forest types in a condition that is typically necessary for species requiring mature forests.

The number of acres reaching the minimum age to be considered old growth is increasing annually as the forest ages. An important point is that the age at which old growth conditions develop varies by forest type and is not simply 150 or 200 years old for all forest types. Minimum ages vary from 80 years for the drier pine dominated types to 180 for the more mesic cove types. Forestwide the forest is aging and the number of acres in earlier successional stages or open woodland conditions is decreasing. From 2000 to 2005 total older forest acreage increased 30,078 acres. From 1993 to 2005 total older forest acreage increased by 94,763 acres.

Currently the GWNF Forest Plan states that timber harvesting can only occur within the Dry Mesic Oak Type (OGFT 21), as all other stands meeting the minimum age in other groups were classified during the Forest Plan revision process as unsuitable for timber production. Timber harvesting on unsuitable timberland has not been done on the GWNF. Timber harvesting of any old growth Dry Mesic Oak stands is disclosed in site-specific environmental analyses. While some individual old age stands of the Dry Mesic Oak type were cut for timber during the past 11 years (<1,000 acres), the total acreage of stands meeting the minimum age within the that group continues to increase. From 2000 to 2005 there was an increase of 18,745 acres. From 1993 to 2005 an increase of 56,522 acres occurred. Thus, timber harvesting is not significantly limiting the old growth forest conditions on the GWNF, and in particular OGFT #21 since it is the most common and widespread group on the GW.

Fire is a natural disturbance process common to most OGFTs, but is very infrequent in northern hardwoods, spruce/fir, and riverfront forests (USDA 1997, Trombulak 1996). Thus, the increased use of prescribed fire is not affecting the overall amount of old growth across the Forest, but instead is restoring and maintaining vegetation in species composition and structure more typical of the fire regime these forests experienced prior to active fire suppression (~1930's). In the absence of fire as a major landscape scale disturbance (which it once was) the structure and composition of forests, regardless of age, will not meet historic old growth conditions (NatureServe, Landfire, Native Tree Society). These forests will be much more closed canopy and closed understory as opposed to the open canopy and very open understory that historically existed. We will meet the age requirements for an old growth forest but will lack much of the associated structure. Thus, the acreage of all old growth forest types meeting minimum necessary ages is steadily increasing as the forest continues to increase in age, but stand structure in most types is not being met due to lack of fire related disturbances.



This discussion focuses on the dry-mesic oak forest group (OGFT 21) since it was the one group where silvicultural activities could occur. Acreage figures given here for 1993 differ from those presented in the 1993 Forest Plan and EIS. The CISC data set from which those numbers were derived in 1993 no longer exists due to computer system conversions implemented since 1993. The number of acres presented here are from the current FSVEG/GIS data set. The only management that has occurred in any old growth forest acres since 1993 that would alter stand age and structure (i.e. timber harvest) has occurred in OGFT 21. All other OGFT acres identified in 1993 still exist. In 1993, an estimated 70,000 acres of Dry-mesic oak existed with old growth characteristics (2004 M&E Report at Appendix G, page 39). The trend in Dry-mesic oak with potential old growth characteristics is shown in the above graph.

In 2008, as displayed in the table that follows, the Dry-mesic oak old growth type group increased to about 123,000 acres. Of this, about 39,000 acres occurs on land unsuitable for timber production and 83,000 occurs on land suitable for timber production.

Furthermore, given hemlock wooly adelgid and based on professional observations, the amount of hemlock, particularly as a component of old growth, has decreased on the Forest.

The amount and distribution of old age forest type groups previously published by the Forest in the 2004 Monitoring Report are slightly different from the amount and distributions in this report. Stands with no age year coded (i.e. null set) were erroneously included in past calculations of minimum age year for a stand to initially be considered as potential old growth. As part of updating the Forest's resource data bases, age year where known, were updated to reflect current conditions. The old growth acreages presented here represent the latest and most up-to-date inventories.

Minimum ages for stands to exhibit "old growth characteristics" used in the 1993 Plan (See FEIS Appendix H) are different than those ages used in the subsequent 1997 Southern Region guidance report (R8-FR 62). The following tables show the comparisons using different minimum ages. As an example, when using the R8 guidelines, the amount of Xeric Pine & Pine-oak (OGFT 24) decreases because the R8 guidelines use a minimum age of 100 while the 1993

GW Plan used a minimum age of 80, therefore the number of acres meeting the minimum age would be less.

The Forest has not identified actual existing old growth that has never been harvested.

The following sets of maps summarize old growth utilizing ages from the 1993 plan and from the Region 8 old growth guidelines. Furthermore, one set depicts future old growth given the existing 1993 Plan allocations.

1. [GW North Half - Summarized Old Growth by 1993 Plan Ages](#)
2. [GW South Half - Summarized Old Growth by 1993 Plan Ages](#)
3. [Entire GW - Summarized Old Growth by 1997 Region 8 Guideline Ages by Patch Sizes](#)
5. [GW North Half - Summarized Future Old Growth by 1993 Plan Management Area Allocations](#)
6. [GW South Half - Summarized Future Old Growth by 1993 Plan Management Area Allocations](#)

**Number of Existing Old Growth Patches by Patch Size Under 1993 George Washington Revised Forest Plan Allocations by
Old Growth Forest Type Groups
(Based on Ages in GW FEIS Appendix H)**

<u>Old Growth Forest Type Groups</u>	<u>Existing Number of Small Patches (1 to 99 Acres)</u>		<u>Existing Number of Medium Patches (100 to 2,499 Acres)</u>		<u>Existing Number of Large Patches (>2,500 Acres)</u>		<u>Existing Total Number of All Patches</u>	
	<u>Based on Ages</u>		<u>Based on Ages</u>		<u>Based on Ages</u>		<u>Based on Ages</u>	
	<u>Suitable Timberland</u>	<u>Unsuitable Timberland</u>	<u>Suitable Timberland</u>	<u>Unsuitable Timberland</u>	<u>Suitable Timberland</u>	<u>Unsuitable Timberland</u>	<u>Suitable Timberland</u>	<u>Unsuitable Timberland</u>
01 - Northern Hardwood Forests								
02 - Conifer & North. Hardwood Forests								
2a-Hemlock-North. Hardwd Subgroup		9		3				12
2b-Wh. Pine-North. Hardwd Subgroup								
2c-Spruce-North. Hardwood Subgroup	3	7					3	7
05 - Mixed Mesophytic Forests	5	18		2			5	20
10 - Hardwood Wetland Forests								
21 - Dry-mesic Oak Forests	859	1,038	75	180			934	1,218
22 - Dry and Xeric Oak Woodlands		2						2
24 - Xeric pine & Pine-oak Forests		2,116		239				2,355
25 - Dry & Dry-mesic Oak-pine Forests	59	87	4	15			63	102
28 - Eastern Riverfront Forests	2	3					2	3
37 - Rocky, Thin-soil Conifer Wood.								
<u>Total Number of Patches By Timber Suitability</u>	928	3,280	79	439			1,007	3,719

Acres by Existing Old Growth Patches Under 1993 George Washington Revised Forest Plan Allocations by Old Growth Forest Type Groups
(Based on Ages in GW FEIS Appendix H)

<u>Old Growth Forest Type Groups</u>	<u>Existing Acres Within Small Patches (1 to 99 Acres)</u>		<u>Existing Acres Within Medium Patches (100 to 2,499 Acres)</u>		<u>Existing Acres Within Large Patches (>2,500 Acres)</u>		<u>Existing Total Acres Across All Patches</u>	
	<u>Based on Ages</u>		<u>Based on Ages</u>		<u>Based on Ages</u>		<u>Based on Ages</u>	
	<u>Suitable Timberland</u>	<u>Unsuitable Timberland</u>	<u>Suitable Timberland</u>	<u>Unsuitable Timberland</u>	<u>Suitable Timberland</u>	<u>Unsuitable Timberland</u>	<u>Suitable Timberland</u>	<u>Unsuitable Timberland</u>
01 - Northern Hardwood Forests								
02 - Conifer & North. Hardwood Forests								
2a-Hemlock-North. Hardwd Subgroup		366		1,051				1,417
2b-Wh. Pine-North. Hardwd Subgroup								
2c-Spruce-North. Hardwood Subgroup	91	217					91	217
05 - Mixed Mesophytic Forests	96	636		262			96	898
10 - Hardwood Wetland Forests								
21 - Dry-mesic Oak Forests	22,728	31,943	16,271	51,023			38,999	82,966
22 - Dry and Xeric Oak Woodlands		80						80
24 - Xeric pine & Pine-oak Forests		64,057		46,737				110,794
25 - Dry & Dry-mesic Oak-pine Forests	1,979	2,326	865	2,490			2,844	4,816
28 - Eastern Riverfront Forests	14	12					14	12
37 - Rocky, Thin-soil Conifer Wood.								
<u>Total Future Acres Within Different Patches By Timber Suitability</u>	24,908	99,637	17,136	101,563			42,044	201,200

**Number of Existing Old Growth Patches by Patch Size Under 1993 George Washington Revised Forest Plan Allocations by
Old Growth Forest Type Groups
(Based on Ages in R8 Old Growth Guidance)**

<u>Old Growth Forest Type Groups</u>	<u>Existing Number of Small Patches (1 to 99 Acres)</u>		<u>Existing Number of Medium Patches (100 to 2,499 Acres)</u>		<u>Existing Number of Large Patches (>2,500 Acres)</u>		<u>Existing Total Number of All Patches</u>	
	<u>Based on Ages</u>		<u>Based on Ages</u>		<u>Based on Ages</u>		<u>Based on Ages</u>	
	<u>Suitable Timberland</u>	<u>Unsuitable Timberland</u>	<u>Suitable Timberland</u>	<u>Unsuitable Timberland</u>	<u>Suitable Timberland</u>	<u>Unsuitable Timberland</u>	<u>Suitable Timberland</u>	<u>Unsuitable Timberland</u>
01 - Northern Hardwood Forests	8	23		1			8	24
02 - Conifer & North. Hardwood Forests								
2a-Hemlock-North. Hardwd Subgroup	3	24		5			3	29
2b-Wh. Pine-North. Hardwd Subgroup	8	9					8	9
2c-Spruce-North. Hardwood Subgroup		2						2
05 - Mixed Mesophytic Forests	45	88		5			45	93
10 - Hardwood Wetland Forests								
21 - Dry-mesic Oak Forests	859	1,038	75	180			934	1,218
22 - Dry and Xeric Oak Woodlands	1	3		1			1	4
24 - Xeric pine & Pine-oak Forests		1,038		84				1,122
25 - Dry & Dry-mesic Oak-pine Forests	119	179	7	21			126	200
28 - Eastern Riverfront Forests		1						1
37 - Rocky, Thin-soil Conifer Wood.								
<u>Total Number of Patches By Timber Suitability</u>	1,043	2,405	82	297			1,125	2,702

Acres by Existing Old Growth Patches Under 1993 George Washington Revised Forest Plan Allocations by Old Growth Forest Type Groups
(Based on Ages in R8 Old Growth Guidance)

<u>Old Growth Forest Type Groups</u>	<u>Existing Acres Within Small Patches (1 to 99 Acres)</u>		<u>Existing Acres Within Medium Patches (100 to 2,499 Acres)</u>		<u>Existing Acres Within Large Patches (>2,500 Acres)</u>		<u>Existing Total Acres Across All Patches</u>	
	<u>Based on Ages</u>		<u>Based on Ages</u>		<u>Based on Ages</u>		<u>Based on Ages</u>	
	<u>Suitable Timberland</u>	<u>Unsuitable Timberland</u>	<u>Suitable Timberland</u>	<u>Unsuitable Timberland</u>	<u>Suitable Timberland</u>	<u>Unsuitable Timberland</u>	<u>Suitable Timberland</u>	<u>Unsuitable Timberland</u>
01 - Northern Hardwood Forests	119	743		187			119	930
02 - Conifer & North. Hardwood Forests								
2a-Hemlock-North. Hardwd Subgroup	11	843		1,502			11	2,345
2b-Wh. Pine-North. Hardwd Subgroup	176	305					176	305
2c-Spruce-North. Hardwood Subgroup		118						118
05 - Mixed Mesophytic Forests	976	2,374		654			976	3,028
10 - Hardwood Wetland Forests								
21 - Dry-mesic Oak Forests	22,728	31,943	16,271	51,023			38,999	82,966
22 - Dry and Xeric Oak Woodlands	40	105		186			40	291
24 - Xeric pine & Pine-oak Forests		31,865		14,747				46,612
25 - Dry & Dry-mesic Oak-pine Forests	3,390	4,980	1,366	3,713			4,756	8,693
28 - Eastern Riverfront Forests		6						6
37 - Rocky, Thin-soil Conifer Wood.								
<u>Total Future Acres Within Different Patches By Timber Suitability</u>	27,440	73,282	17,637	72,012			45,077	145,294

**Number of Future Old Growth Patches by Patch Size Under 1993 George Washington Revised Forest Plan Allocations by
Old Growth Forest Type Groups**
(Regardless of Age, Based on Forest Plan Mgmt Area Allocation)

<u>Old Growth Forest Type Groups</u>	<u>Future Number of Small Patches</u> (1 to 99 Acres)		<u>Future Number of Medium Patches</u> (100 to 2,499 Acres)		<u>Future Number of Large Patches</u> (>2,500 Acres)		<u>Future Total Number of All Patches</u>	
	<u>1993 Plan Allocation</u>		<u>1993 Plan Allocation</u>		<u>1993 Plan Allocation</u>		<u>1993 Plan Allocation</u>	
	<u>Suitable Timberland</u>	<u>Unsuitable Timberland</u>	<u>Suitable Timberland</u>	<u>Unsuitable Timberland</u>	<u>Suitable Timberland</u>	<u>Unsuitable Timberland</u>	<u>Suitable Timberland</u>	<u>Unsuitable Timberland</u>
01 - Northern Hardwood Forests	36	63	5	5		1	41	69
02 - Conifer & North. Hardwood Forests								
2a-Hemlock-North. Hardwd Subgroup	40	82	1	13			41	95
2b-Wh. Pine-North. Hardwd Subgroup	641	286	47	16			688	302
2c-Spruce-North. Hardwood Subgroup	4	10		1			4	11
05 - Mixed Mesophytic Forests	494	518	63	58		1	557	577
10 - Hardwood Wetland Forests	6						6	
21 - Dry-mesic Oak Forests	1,128	1,244	297	259	25	31	1,450	1,534
22 - Dry and Xeric Oak Woodlands	3	8		1			3	9
24 - Xeric pine & Pine-oak Forests		2,343		261		1		2,605
25 - Dry & Dry-mesic Oak-pine Forests	942	1,223	115	184			1,057	1,407
28 - Eastern Riverfront Forests	2	4		1			2	5
37 - Rocky, Thin-soil Conifer Wood.		2						2
<u>Total Number of Patches By Timber Suitability</u>	3,296	5,783	528	799	25	34	3,849	6,616

Acres by Future Old Growth Patches Under 1993 George Washington Revised Forest Plan Allocations by Old Growth Forest Type Groups
 (Regardless of Age, Based on Forest Plan Mgmt Area Allocation)

<u>Old Growth Forest Type Groups</u>	<u>Future Acres Within Small Patches (1 to 99 Acres)</u>		<u>Future Acres Within Medium Patches (100 to 2,499 Acres)</u>		<u>Future Acres Within Large Patches (>2,500 Acres)</u>		<u>Future Total Future Acres Across All Patches</u>	
	<u>1993 Plan Allocation</u>		<u>1993 Plan Allocation</u>		<u>1993 Plan Allocation</u>		<u>1993 Plan Allocation</u>	
	<u>Suitable Timberland</u>	<u>Unsuitable Timberland</u>	<u>Suitable Timberland</u>	<u>Unsuitable Timberland</u>	<u>Suitable Timberland</u>	<u>Unsuitable Timberland</u>	<u>Suitable Timberland</u>	<u>Unsuitable Timberland</u>
01 - Northern Hardwood Forests	714	1,979	785	859		5,288	1,499	8,126
02 - Conifer & North. Hardwood Forests								
2a-Hemlock-North. Hardwd Subgroup	1,088	2,499	111	2,876			1,199	5,375
2b-Wh. Pine-North. Hardwd Subgroup	18,207	5,798	10,420	3,286			28,627	9,084
2c-Spruce-North. Hardwood Subgroup	104	285		134			104	419
05 - Mixed Mesophytic Forests	14,220	13,210	13,307	13,446		3,330	27,527	29,986
10 - Hardwood Wetland Forests	111						111	
21 - Dry-mesic Oak Forests	27,643	31,973	140,755	108,015	108,567	261,954	276,965	401,942
22 - Dry and Xeric Oak Woodlands	99	208		186			99	394
24 - Xeric pine & Pine-oak Forests		70,608		50,747		3,015		124,370
25 - Dry & Dry-mesic Oak-pine Forests	28,020	36,928	20,519	37,053			48,539	73,981
28 - Eastern Riverfront Forests	14	62		118			14	180
37 - Rocky, Thin-soil Conifer Wood.		24						24
<u>Total Future Acres Within Different Patches By Timber Suitability</u>	90,220	163,574	185,897	216,720	108,567	273,587	384,684	653,881

The following tables show that number of patches and acreages change when all individual OGFT are aggregated into as big a patch as possible.

Number of Existing and Future Old Growth Patches
Under 1993 George Washington Revised Forest Plan Allocations
(Aggregated Regardless of Type)

<u>Category</u>	<u>Number of Small Patches</u> <u>(1 to 99 Acres)</u>		<u>Number of Medium Patches</u> <u>(100 to 2,499 Acres)</u>		<u>Number of Large Patches</u> <u>(>2,500 Acres)</u>		<u>Total Number of All Patches</u>	
	<u>1993 Plan Allocation</u>		<u>1993 Plan Allocation</u>		<u>1993 Plan Allocation</u>		<u>1993 Plan Allocation</u>	
	<u>Suitable</u> <u>Timberland</u>	<u>Unsuitable</u> <u>Timberland</u>	<u>Suitable</u> <u>Timberland</u>	<u>Unsuitable</u> <u>Timberland</u>	<u>Suitable</u> <u>Timberland</u>	<u>Unsuitable</u> <u>Timberland</u>	<u>Suitable</u> <u>Timberland</u>	<u>Unsuitable</u> <u>Timberland</u>
(Existing Potential Old Growth Using 1993 Forest Plan Ages)	875	2,292	79	438	0	3	954	2,733
Existing Potential Old Growth (Using 1997 R8 Guideline Ages)	933	1,635	87	320	0	3	1,020	1,958
Future Potential Old Growth	N/A	1,092	N/A	240	NA/	28	NA/	1,360

Acres of Existing and Future Old Growth Patches
Under 1993 George Washington Revised Forest Plan Allocations
(1,000 Acres) (Aggregated Regardless of Type)

<u>Category</u>	<u>Acres of Small Patches</u> <u>(1 to 99 Acres)</u>		<u>Acres of Medium Patches</u> <u>(100 to 2,499 Acres)</u>		<u>Acres of Large Patches</u> <u>(>2,500 Acres)</u>		<u>Total Acres of All Patches</u>	
	<u>1993 Plan Allocation</u>		<u>1993 Plan Allocation</u>		<u>1993 Plan Allocation</u>		<u>1993 Plan Allocation</u>	
	<u>Suitable</u> <u>Timberland</u>	<u>Unsuitable</u> <u>Timberland</u>	<u>Suitable</u> <u>Timberland</u>	<u>Unsuitable</u> <u>Timberland</u>	<u>Suitable</u> <u>Timberland</u>	<u>Unsuitable</u> <u>Timberland</u>	<u>Suitable</u> <u>Timberland</u>	<u>Unsuitable</u> <u>Timberland</u>
(Existing Potential Old Growth Using 1993 Forest Plan Ages)	23,000	69,000	19,000	122,000	0	11,000	41,000	201,000
Existing Potential Old Growth (Using 1997 R8 Guideline Ages)	25,000	49,000	20,000	85,000	0	11,000	45,000	145,000
Future Potential Old Growth	N/A	33,000	N/A	88,000	N/A	533,000	N/A	654,000

The tables presented above show not only acres by OGFT, but also by “patch size”. The 1997 Regional Guidance states that as part of the old-growth management strategy each Forest will develop a network of old-growth areas, although there is no need for these patches to be physically interconnected by the use of old growth corridors (R8 Guidance, 1997). Numbers and acres of existing and future patches were derived from FSVEG stand-level data and analyzed using GIS. Acres are presented using ages from both the 1993 Plan and 1997 Regional Guidance. One item of note is that as the Forest gets older (stands age), the number of small and medium patches decreases as they aggregate together to make large patches, therefore the number of large patches increases dramatically over time.

3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? Change in the Plan is warranted with regards to old-growth to incorporate 1997 Regional guidance into the Plan.

c. Tentative Options or Proposed Actions for Change:

- C-1. Adopt the Region 8 guideline and its ages; Remove acres of old-growth forest types 1, 2a, 2b, 2c, 5, 10, 22, 24, 25, 28, and 37 occurring on lands suitable for timber production from suitable base. All OGFT 21 on suitable acreage will be inventoried for old-growth characteristics prior to any timber harvest project (similar to current Plan). All other existing potential old growth is allocated to a network of small, medium, and large patches for developing or restoring old growth conditions.
- C-2. Adopt the Region 8 Guideline and its ages; Remove acres of old-growth forest types 1, 2a, 2b, 2c, 5, 10, 22, 24, 28, and 37 occurring on lands suitable for timber production from suitable base. All OGFT 21 and 25 on suitable acreage will be inventoried for old-growth characteristics prior to any timber harvest project. All other existing potential old growth is allocated to a network of small, medium, and large patches for developing or restoring old growth conditions.
- C-3. Adopt the Region 8 Guideline and its ages; Remove acres of old-growth forest types 1, 2a, 2b, 2c, 5, 10, 22, 24, 28, and 37 occurring on lands suitable for timber production from suitable base. OGFT 21 and 25 on suitable acreage will not be inventoried for old-growth characteristics since acreage and patches existing and developing will be enough to meet late successional or old growth needs and no inventory or analysis will be done prior to any timber harvest project.
- C-4. Defer all Plan allocations until we have a better inventory on where existing old growth exists on the Forest. Follow Jefferson Forest Plan process of looking at old 1930's aerial photography along with ground-truthing inventory. From that, create a GIS data base inventory of known existing old growth. Continue to inventory all stands using the R8 criteria and follow Region 8 process at the site-specific timber sale project level for newly identified old growth.

5. What are the Consequences of Not Changing?

We would not acknowledge that we are using the current Regional guidance. There will be very little consequences on old growth as site-specific inventory and analysis would still occur at the project level. The agency would not propose to harvest in any OGFT except OGFT 21, even though acres of other OGFT are located on suitable timberland. Based on the past trends, the future of the existence of old-growth is promising as over time true old growth characteristics will develop where timber management does not occur. We would continue to inventory for old growth characteristics in suitable timber stands, even though an adequate network of growth or potential old growth is already in place.

Proposed Action

Propose Option C3.

6. Recommendations for Plan Revision

The George Washington is an aging Forest. The acres of Forest that meet the definition of old growth increased from 154,000 to 253,000 between 1993 and 2008. During the next fifteen years it is expected to increase another 130,000 acres. Combined with the future old growth that will develop in wilderness, backcountry recreation areas and special biological areas, this old growth will be well distributed in a network of small, medium and large blocks across the Forest,

We should adopt the Region 8 guidelines to be compatible with the other Forests and make all Old Growth Forest Types, except types 21 (Dry-Mesic Oak Forests) and 25 (Dry & Dry-Mesic Oak-Pine Forests), unsuitable for timber production. With the large amount of land already identified as old growth in these two forest types and the amount of land that will be soon qualifying as old growth, the need for diversity of age and structure within these forest types is more important than the need for additional acres of old-aged stands. All stands will be inventoried for their old growth characteristics before making a decision to harvest.

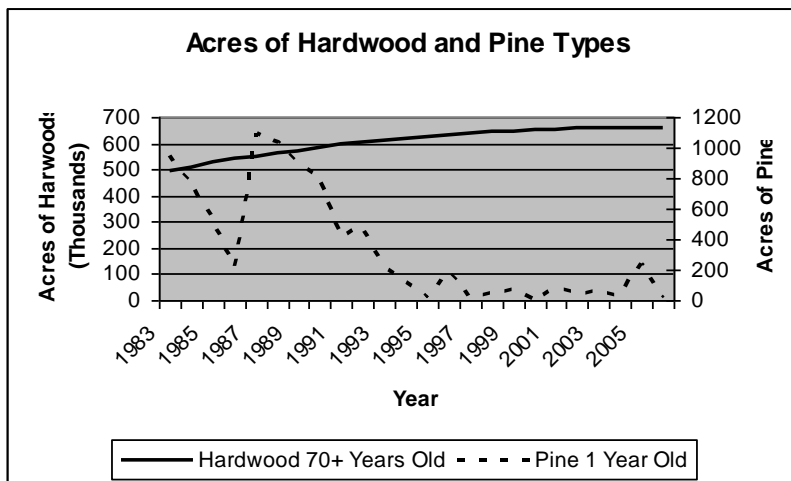
C. Conversion

1. What was the Plan Striving For?

The Plan provided guidance that direct planned type conversion was not appropriate on the Forest (Plan page 2-6). Type conversion in this context means planting pines on sites currently supporting hardwoods. Specifically, no conversion of hardwood forest types to pine forest types was needed to meet the desired condition of any management area.

2. Where is the Plan Now?

The following graph shows the trend in hardwood to pine types. Additionally, the Forest does not know of any project where a hardwood stand was converted to a pine stand since the 1993 Plan was approved.



3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes. Although the acres of 1 year old pine includes acres of former pine types that have been regenerated, the sharp decrease in acres of 1 year old pine in 1992 indicates the effectiveness of the “no conversion” goal of the GW Plan.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? No.

b. Why? We have discontinued conversion of hardwood stands to pine through planting. There is still no need for increased pine conversion to meet Forest Plan Goals and Objectives. This issue will not be addressed any further.

D. Riparian Areas

1. What was the Plan Striving For?

The GWNF Plan managed riparian areas as a separate management area to protect and enhance the unique riparian resource values (Plan page 2-7, 3-92 to 3-100). Riparian areas were recognized as important components of the forest ecosystem because of the large number of species of plants and animals they support and the associated ecological, social, and economic benefits. Functioning riparian ecosystems were described as being healthy, diverse, productive and self-sustaining. Riparian dependent resources and values were given priority. One of the overall objectives of the Plan was the restoration, maintenance, and enhancement of riparian areas and their dependent resources. This included the following desired conditions for riparian areas: (1) Aquatic habitats maintain aquatic biodiversity and contain water quality, food, and necessary habitat for all life stages of native fish and economically important non-native species. (2) Vegetation (both living and dead) is taxonomically diverse. The abundance and structural diversity of plant communities provide stable, complex, and self-sustaining habitats for various life states of wildlife. (3) Dispersed recreation opportunities, such as hunting, fishing, hiking, and watching wildlife are generally associated with riparian areas, but impacts are minimized by limiting the size and location of the recreation. Activities are monitored and, where necessary, controlled to minimize impacts on the riparian areas. (4) Natural variation and succession of plant communities occurs. Rehabilitation of past and future

impacts (both natural and human-caused) may be necessary to protect valuable resources and to enhance the recovery of riparian form and function. (5) Water quality meets or exceeds state standards, for aquatic biodiversity and beneficial uses downstream. Sedimentation rates are in equilibrium with the watershed and stabilize or improve the biological condition of the stream. Specific objectives for instream habitat were: pool habitats occupy 35% to 65% of available habitat; streams supporting cold water habitats have 125 to 300 pieces of large woody debris (LWD) per stream mile, a maximum water temperature of 69°F, and dissolved oxygen values greater than 7.0 ppm; streams supporting cool water habitats have 75 to 200 pieces of LWD per mile, a water temperature regime within 2°F of ambient, and dissolved oxygen values greater than 7.0 ppm or saturation values.

Most of the riparian areas on the Forest were allocated to Management Area 18 (Plan pages 3-92 to 3-100). Management direction for this management area complemented the management direction for adjoining management areas. Therefore, riparian areas were to be managed three different ways depending on whether they were adjacent to lands suitable for timber production, lands unsuitable for timber production, or lands upstream of municipal water supplies.

Physical and biological characteristics were to be used to determine riparian area widths. Streamside management zones were to be applied to both perennial and intermittent streams. These were 66 feet wide for perennial streams and 33 feet wide for intermittent streams, with increased widths for filter strips on steeper slopes. Depending on the width of the riparian area, streamside management zones might be located entirely within, or partially outside, the riparian area. In the portion of the streamside management zone outside the riparian area, up to 20% basal area removal of trees was allowed along perennial streams. Up to 50% basal area removal of trees was allowed along intermittent streams within the streamside management zone.

Adjacent to lands suitable for timber production, the riparian area beyond the 66-foot streamside management zone was suitable for timber production. For the riparian area within the streamside management zone, vegetation was managed to meet the desired condition of the aquatic resources.

Springs and permanent seeps were to be protected from disturbance during management activities. Lakes, ponds, and wetlands were included as part of the riparian area.

2. Where is the Plan Now?

DFC 1 – Aquatic habitats

LWD and instream habitat surveys

Forest personnel surveyed stream habitat to measure DFC parameters identified in the 1993 Revised GWNF Forest Plan. Surveys were conducted on portions of the Pedlar Ranger District in 1995 and 2005, Lee District in 2001, Dry River District in 2002, 2003, 2004 and 2005, and the Warm Springs in 2005. Overall, 631 km (392 miles) of streams were surveyed using a modified Basinwide Visual Estimation Technique (BVET [Doloff et al. 1993]) to estimate woody debris loading, percentage of pool and riffle area, and the width of the riparian area of streams.

The distribution of woody debris was also mapped. See the table below for a summary of LWD and % pool area.

**Miles of Stream Habitat Surveyed In 1995-2005
George Washington National Forest**

Year Surveyed	# of Stream Miles Surveyed	% of Streams Below Minimum Pool Area DFC	% of Streams Below Minimum LWD DFC
1995	113	48	44
2001	75	75	35
2002	57	62	33
2003	55	70	19
2004	35	71	78
2005	57	96	83

A comparison of individual streams surveyed in 1995 and again in 2005 on the Pedlar District showed a decrease in the median number of pools, number of riffles, and total LWD per km, while the median pool and riffle surface area increased. This report suggests that in 1995 only 25% of streams met the DFC for stream area in pools and less than half of streams met the DFC for total LWD. By 2005 no streams met the DFC for pool area and 75% of streams did not meet the DFC for total LWD. The changes in pool/riffle ratio, number of pools and riffles per km, and pool and riffle surface area are all consistent with decrease in total LWD. The largest decrease of LWD was in the smallest size class. These pieces most often form pool habitat by combining with other small woody debris to form debris jams. In general the smallest size classes are the most easily dislodged and transported downstream or out of the active stream channel during high flows (Hilderbrand et al. 1998, Montgomery et al. 2003). Loss of debris accumulations from long riffle areas following flood events could result in the changes in stream habitat observed. The median amount of the largest size classes of LWD either remained the same or increased in the reaches between 1995 and 2005.

Stream structures

Following Plan approval, across all Ranger Districts, large woody debris was deliberately added to many streams that did not meet the DFC. In addition, efforts were made in the North River to return a highly modified stream channel to a more natural condition. Past hydrological modifications of the North River include bank armoring with rock gabions and channelization to protect the road from frequent floods. These modifications resulted in a wide, shallow channel that lacks fisheries habitat complexity. Under a recent project, rock veins and weirs, and other structures made of natural materials were placed in the stream channel to consolidate streamflow and increase sinuosity. Non-functional rock gabions blocking the natural floodplain were removed.

Water Quality

See Water Quality section elsewhere in this report for a discussion about stream water quality, benthic macroinvertebrates, and sedimentation.

DFC 2 – Stable and complex vegetation community

The Forest Plan allowed up to 20% basal area removal of trees along perennial non-native trout streams and 50% basal area along intermittent streams. There was no regulation of vegetation management along ephemeral streams. One timber sale was designed to specifically address the issue of removing non-native pine plantations along the North River.

DFC 3 – Dispersed Recreation opportunities and impacts

The following are examples of projects that were done to improve riparian conditions. It is not an all-inclusive list, and it is recognized that many more projects have occurred to improve watershed conditions (see the Watershed Improvement Needs list and Soil Productivity discussion elsewhere in this report). In addition, projects specific to fishery development and angler access are in the Fisheries discussion elsewhere in this report). It is also recognized that many more dispersed recreation opportunities and problems exist across the Forest, and have yet to be addressed.

- Relocated portions of North River Road outside riparian area and reduced number of times road crossed North River.
- Moved ½ mile of stocking road along Jackson River at Poor Farm to reduce soil and water impacts, Warm Springs District
- Closed and rehabilitated ½ mile of stocking road along Jackson River at Hidden Valley to reduce soil and water impacts, Warm Springs District
- Closed unauthorized user-created roads, improving 4 acres in the Wilson Creek watershed, Warm Springs District
- Constructed bridges and hardened fords on the Taskers Gap ATV area, Lee District
- Closed and rehabilitated 2.5 miles of Horse Mountain Road, James River District
- Closed and rehabilitated 2.5 miles of Childrens Forest Road, James River District
- Moved portion of Peters Mill OHV road away from the stream, Lee District

DFC 4 – Rehabilitation from natural and human impacts

- Planted trees to establish a forested riparian buffer along Hidden Valley hayfields, Warm Springs District
- Moved road away from Brown Mountain pond, Warm Springs District
- Moved portion of North River Road out of floodplain, North River District
- Restricted vehicular access to Potts Pond, James River District
- Rehabilitated landslides in 4 watersheds following 1995 and 1996 floods, Pedlar District
- Closed 1 mile of road near Laurel Run to prevent dispersed vehicle camping and vehicle use along the stream, Warm Springs District

Site-specific operational Projects that have not moved the Forest toward the Riparian DFC

- Developed Crabtree Falls Parking lot in riparian area.
- Have not moved toilets out of floodplain where they repeatedly get flooded at Elkhorn Lake.
- Use of portions of Peavine, Shoe Creek, and Otter Creek OHV roads continue to impact riparian areas along applicable creeks.
- Some dispersed camping sites within riparian areas continue to degrade soils and vegetation.

- Efforts to fence cows out of the Shenandoah River have failed and cows continue to cause bank erosion and resulting sedimentation in the grazing allotment(s).

DFC 5 – Water quality and sedimentation

See Water Quality section elsewhere in this report for a discussion about stream water quality, benthic macroinvertebrates, and sedimentation.

3. Did Management Activities Move the Forest towards the Desired Future condition?

DFC 1 – Aquatic habitats

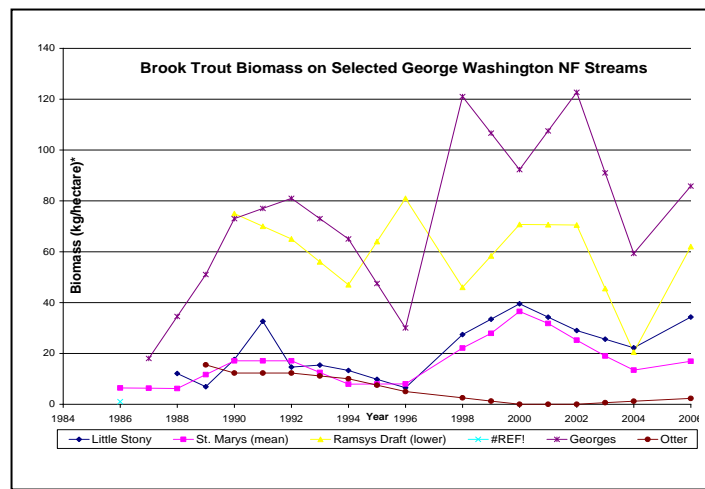
Management actions such as adding large woody debris and other types of in-stream structures moved particular streams toward meeting the DFC. However, the vast majority of the Forest's streams received no direct management action. Although comparisons of 1995 and 2005 stream surveys showed a decrease in streams meeting the desired future conditions for pool/riffle ratio and total LWD, the median amount of the largest size classes of LWD either remained the same or increased during that time period. The largest size classes (size 3: > 5 m long, 10-50 cm diameter; size 4: >5 m long, >50 cm diameter) are most stable and can easily have residence times of greater than 10 years in Appalachian streams with relatively little movement (Andy Dolloff, unpublished data). Continued supply of these size classes to the stream may result in increases in total pool habitat in the future.

Such differences highlight the fact that LWD dynamics are governed by a wide array of chronic and acute events, both natural and anthropogenic, including flooding, fires, stand maturation, riparian composition, and timber harvest (Dolloff and Warren 2003, Benda et al. 2003). For example, insect infestations such as gypsy moth or hemlock wooly adelgid can result in the relatively rapid death of many trees. Smaller size classes of LWD are added to the stream as dead trees standing in the riparian area begin to shed branches and larger size classes are added as these trees continue to decompose and eventually fall across the stream channel. Natural additions of LWD can come through slow attrition or in large pulses if stands are impacted by events such as hurricanes. It is expected that streams will move toward the DFC through natural process if riparian forests are allowed to mature and more trees are left in the vicinity for recruitment of future LWD (Benda et al. 2003; Dolloff and Warren 2003, Boyer and Berg 2003, Reich et al. 2003, Morris et al. 2007).

BROOK TROUT- Under the 1993 Revised Plan, fisheries resources were to be managed to develop and maintain aquatic habitats that contain suitable water quality, food chains, and necessary habitats for all life stages of native fish, and to facilitate sport fishing. Lakes, ponds, reservoirs and most perennial streams are contained in Management Area 18. The desired future condition for Management Area 18 gives specific objectives for large woody debris, water temperature, sedimentation, and dissolved oxygen levels for streams. Fisheries direction for lakes, ponds, and streams is provided in the discussion of Forest Plan Management Area 18 and in the Riparian Area and Water Quality sections.

As shown in the table, populations of brook trout tend to fluctuate greatly over time. These findings do not necessarily suggest negative impacts to those streams from management activities, but rather that trout numbers are often highly variable due to natural occurrences (drought, floods, high temperatures, etc). As documented in Appendix G of the annual M&E reports, timber harvesting and other management activities did not significantly decrease

habitat or populations of brook trout. Furthermore, some management activities, such as stream liming and habitat restoration, were specifically designed to improve brook trout habitat and increase their populations.



The following are examples of projects done to increase angler access and recreational fisheries.

Development of New Fisheries and General Angler Access.

- Developed Pedlar River delayed harvest fishery and angler access, Pedlar District
- Fishing access steps at Brandywine Lake, North River District
- Rehabbed angler access point on Jackson River at Hidden Valley, Warm Springs District
- Rehabbed angler access point on Jackson River at Poor Farm, Warm Springs District

Universally Accessible Fishing Piers

- Sherando Lake, Pedlar District
- Lake Moomaw, Warm Springs and James River Districts
- Rockcliff lake and Tomahawk Pond, Lee District

CENTRARCHID (SUNFISH) FAMILY - As documented in Appendix G of the annual M&E reports, Forest Service activities, such as the creation of structures in reservoirs, are beneficial to members of the sunfish family. However, even though the addition and maintenance of underwater structures in Forest reservoirs is necessary for healthy self-sustaining warm water fish populations, these populations are heavily manipulated through fishing regulations and harvest pressure (Spotte 2007; Noble 2002; Quinn 2002; Wilson and Dicenzo 2002; Swennson 2002). Because of this, we recommend that the Forest continue to work with State agencies to monitor warm water fish and enhance habitat on the Forest land, but not include the sunfish family as a Species of Interest in the revised Forest Plan.

DFC 2 – Stable and complex vegetation community

Few vegetation management activities occurred in the streamside management zones near perennial streams. A timber sale was developed and sold to remove non-native red pine from

the riparian area of North River. Vegetation management did take place along intermittent and ephemeral stream channels for non-riparian purposes. Insect infestations of gypsy moth and hemlock wooly adelgid, floods, and landslides changed the composition of the riparian vegetation in specific locations. As shown in the above examples, the Forest moved toward the DFC in some areas but not in others.

DFC 3 – Dispersed Recreation opportunities and impacts

DFC 4 – Rehabilitation from natural and human impacts

DFC 5 – Water quality and sedimentation

As shown in the above examples, the Forest moved toward the DFC in some areas but not in others.

4. Is There a Need for Change?

- a. Is a Change in the Plan warranted? Yes
- b. Why? See viewpoints 1 and 2 that follow.

Viewpoint 1

Riparian Resources

Although the existing Plan recognizes the value of riparian areas and strives to protect and enhance the unique riparian resource values, the standards and streamside management zone widths are tiered to the protection of water quality and instream resources, and do not accommodate the more terrestrial riparian-dependent resources (Crawford and Semlitsch 2006, CRWP and Schwartz 2006, DeGraaf and Yamasaki 2000, Semlitsch and Bodie 2003, Tiner 1999, Wenger 1999). Crow et al. (2000) give an example of recommended buffers 20 to 30 ft wide for small mammals, 10 to 300 ft for amphibians, and 650 ft for wood ducks. Recommendations of buffer width vary by species group, but should also depend on the context in which riparian areas exist in the broader landscape.

Intermittent and Channeled Ephemeral Streams

The existing Plan only considers perennial streams as having riparian areas. This is in contrast to the concepts identified by Ilhardt et al. in the book Riparian Management in Forests of the Continental Eastern United States (2000) where she states:

Despite these differences in riparian components and their character of components from an ecological perspective, there is agreement that a riparian area:

- Includes the water or feature that contains or transports water for a portion of the year
- Is an ecotone of interaction between the aquatic and terrestrial ecosystem
- Has highly variable widths or boundaries

In the existing GWNF Plan only intermittent streams with bankfull widths greater than 3 feet are provided with buffer zones. Intermittent streams with scoured widths less than 3 feet or channeled ephemeral streams are given no protection. Richards and Hollingsworth (2000) state that “although intermittent or seasonally dry channels are often ignored or regarded as insignificant by managers, most sediment enters stream systems through these small streams during storms. Riparian management must include guidelines and best management practices (BMPs) designed to protect the integrity and functions of headwater streams”. Welsch

et al. (2000) further emphasize that to be effective, riparian guidelines must include small streams and dry channels.

An intermittent stream channel is a watercourse that flows in response to a seasonally fluctuating water table; a channeled ephemeral stream is a watercourse that flows in direct response to precipitation in a well defined channel. There are not discrete boundaries between a perennial, intermittent, and channeled ephemeral stream; they are all part of channel continuum that shifts in response to climatic and watershed conditions. Illustrating this is John Hewlett's variable source area concept. Based on observations and data from Coweta, Hewlett explained that during floods, streamflow increases as the variable source extends into ephemeral channels. During a large storm, channel length increases "to perhaps ten or twenty times the perennial length" (Hewlett 1961). It is important to recognize that intermittent and channeled ephemeral streams are part of the overall riparian system. The stream continuum has longitudinal physical, chemical, and biological gradients (Parrott et al. 2000).

In addition to being part of the overall channel continuum, intermittent and channeled ephemeral streams strongly influence downstream ecosystems by controlling the input of sediment, water, woody debris, and nutrients to the rest of the channel system. Not only are a high proportion of watershed products (sediment, water, woody debris, and nutrients) produced from intermittent and ephemeral channels, but these channels also store large volumes of hill slope materials and release them over long periods. For example, much of the sediment eroded from hill slopes during a major storm may be stored in the smallest channels, allowing it to be released gradually at levels that may not harm downstream environments. These sites can be particularly important as potential sediment sources because many are susceptible to gully formation and debris flow erosion when destabilized (Kappesser 1999).

Following the extensive logging that occurred over much of the Forest in the past 200 years, slash and debris could persist for 20 to 50 years in streams before declining to lower levels. Wood loading in streams would then gradually increase over many years as the riparian forest matured and provide a source of large wood (Dolloff and Webster 2000). This last process may require centuries (Hornbeck and Kochenderfer 2000). As stated in the previous section, it is expected that streams will move toward the DFC through natural process if riparian forests are allowed to mature and more trees are left in the vicinity for recruitment of future LWD.

Managing for big trees in riparian areas can speed the accrual of woody debris to streams, including intermittent and ephemeral channels (Richards and Hollingsworth 2000). Although it has long been recognized that LWD is important in perennial streams as a source of habitat complexity, and is positively correlated with increased fish production (Richards and Hollingsworth 2000); the importance of allochthonous matter (leaves and wood) increases as stream size decreases. In addition to leaves and twigs being the basis of the food chain in headwater streams, large pieces of wood influence flow velocity, channel shape, and sediment storage and routing. The stair-step profile created by woody debris dams dissipates much of the energy in small, high-gradient streams (Dolloff and Webster 2000). Research indicates that one-third of the biomass of litter in a stream comes from distances beyond 100 ft. This distance exceeded the mean maximum tree height for the study system of approximately 72 ft (Palik et al. 2000). Welsch et al. (2000) recommend riparian forest buffer widths equal to at least two tree lengths.

Pauley et al. (2000) recognize the riparian zones associated with headwater streams as being transitional areas between shallow water and terrestrial habitat and supporting a diversity of salamanders and frogs. The maintenance of streamside forests at the scale of entire

watersheds will help determine long-term persistence and local viability of amphibian populations (Duncan 2003). No reptiles use these areas for permanent residence, but often use these zones for foraging, thermoregulation, and moisture retention (Pauley et al. 2000). Burrowing crayfish often use the moist soil conditions prevalent in headwater streams. Likewise, the American woodcock is an example of a bird that requires moist soil containing earthworms and is found almost exclusively in wooded riparian habitats during dry summers and through the autumn migration. Many other birds depend on riparian forest habitats for nesting and roosting (DeGraaf and Yamasaki 2000).

A wealth of scientific research over the past decade has recognized the important role of intermittent and channeled ephemeral headwater streams in maintaining water quality and quantity, recycling nutrients, and providing habitat for plants and animals. It is appropriate to provide management direction for the areas around not only perennial stream channels, but also intermittent and channeled ephemeral streams.

Aquatic Organism Passage and Riparian Grazing

The GWNF Forest Plan did not specifically address several other important issues: aquatic organism passage and riparian grazing.

Recent National and Regional attention has focused on the issue of aquatic organism passage. Land managers recognized that instream barriers can prevent migration, dispersal, and colonization, leading to genetic isolation and possible extirpation. Specifically, culverts at road crossings can be barriers to fish or other aquatic organisms (Gibson et al. 2005, Verry 2000).

Forest Service researchers used the '*National Inventory and Assessment Procedure for Identifying Barriers to Aquatic Organism Passage at Road-Stream Crossings*' developed by the USFS San Dimas Technology and Development Center to assess road stream crossings on the Forest. On the GWNF, over 500 stream-road crossing surveys were conducted between 2003 and 2006. The majority of crossings were not passable for all fish types (strong, moderate, or weak swimmers and leapers). This inventory can be used to identify barriers to aquatic passage and prioritize them for replacement/repair based on maximum benefit to aquatic organisms or habitat.

Streams where bottomless arch culverts were installed at road crossings to improve aquatic organism passage on the GWNF include:

- Laurel Run and Hunkerson Gap on the Lee District
- Middle River and Slatelick on the North River District
- Mill Creek on the Pedlar District

Efforts to fence cows out of the Shenandoah River have failed at some sites and they are causing bank erosion and sedimentation in the grazing allotment(s). The current GWNF plan is silent on the management of grazing allotments in riparian areas. Because of the need for streambank stability, shading, limiting sedimentation, and diverse vegetative communities, Welsch et al. (2000) recommend limiting grazing activities at the water's edge and severely restricting livestock's access to streams to benefit mammal, bird, amphibian, and reptile riparian habitats, in addition to benefiting aquatic habitats.

Best Management Practices

Regarding Best Management Practices, GWNF Forest Plan Standard 208 (page 3-145) states that: The Forest stays current with Virginia and West Virginia "best management practices"

(BMPs) and erosion and sediment control regulations and amends the Forest Plan if BMP modifications or regulation changes become more restrictive than Revised Plan standards.

The following table compares current BMPs with GWNF Plan and revised Jefferson Plan standards for streamside management zones. *VZ=Vehicle Exclusion Zone, SS=Shade Strip, FS=Filter Strip. Percentages refer to % slope.

<u>Stream Characteristic</u>	<u>Virginia BMPs</u>	<u>WV BMPs</u>	<u>1993 GWNF Plan*</u>	<u>2004 Jefferson Plan</u>
Perennial	warm water fisheries (all other waters including wetlands) = 50 ft Trout water 0-10% = 60 ft Trout water 11-20% = 70 ft Trout water 21-45% =100 ft Trout water 45+% =120 ft Municipal 0-10%=100 ft Municipal 11-20%=145 ft Municipal 21-45%=145 ft Municipal 45+% =200 ft	100 ft	66 ft for VZ & SS. FS 0-20% = 66 ft FS 21-45% = 100 ft FS 45+% =200 ft	0-10% = 100 ft 11-45% =125 ft 45+% =150 ft
Intermittent	warm water fisheries (all other waters including wetlands) = 50 ft	100 ft	33 ft for VZ & SS. FS 0-20% = 33 ft FS 21-45% = 50 ft FS 45+% =100 ft	0-10% = 50 ft 11-45% =75 ft 45+% =100 ft
Channeled ephemeral		25 ft		25 ft

Current GWNF Plan standards are not consistent with the current VA and WV BMP widths. The State BMP widths also vary in their recommendations on management activities.

Jefferson Riparian Corridor

Similar to the GWNF Plan, the revised Jefferson Plan manages riparian areas as a separate Management Area (Riparian Corridor) with a focus on riparian resources. However, in contrast to the GWNF Plan, the revised Jefferson Plan incorporated wider management zones, recognizing riparian values other than, and in addition to, aquatic resources and buffering streams. It is also more in line with current Virginia and West Virginia BMPs. Although the Riparian Corridor area has pre-defined widths to facilitate implementation and analysis, the actual corridor widths can be changed on a site specific basis through IDT input. In addition, the portion of the corridor that is extended based on slope is managed as a vehicle exclusion zone, and does not prohibit timber management. In this way, Jefferson Plan Riparian Corridor direction tried to recognize the need to easily implement direction on the ground, and also the variability in riparian systems. Standards that address channeled ephemeral streams are included in the Forestwide direction. Management direction for the 25 foot corridor on either side of a channeled ephemeral stream does not prohibit timber management, but does focus attention on the importance of these streams, and their relationship to the overall hydrologic system.

Currently within the GWNF National Forest, the same management direction as the Jefferson Forest Plan riparian corridors is applied to 157,465 acres (15%) of the GWNF through

provisions contained in the Federally Listed Threatened and Endangered Mussel and Fish Conservation Plan. These acres are in sixth code HUC watersheds containing aquatic T&E species.

Viewpoint 2

a. The current GWNF Streamside Management Zones are 66' and 33' for perennial and intermittent streams, respectively. The current Virginia BMP's are 50' for both non-trout streams and intermittent streams, respectively. The Virginia BMP ranges from 60 – 100' for perennial trout streams depending upon steepness of slope. The current West Virginia BMP's are 100' for both perennial and intermittent streams and 25' for ephemerals. Vegetation management is permitted within these zones to varying degrees. During timber sale layout, we have been implementing either the appropriate State BMP's or the Forest Plan SMZ, whichever is more restrictive. In those circumstances where the State guidelines were wider, they did not conflict with the Forest Plan; thus no Forest Plan Amendment was necessary. However, during Forest Plan Revision it would be prudent to revise the SMZ guidelines to correspond to the respective State BMP's.

b. Adoption of the Conservation Plan in the approximately 20% of the Forest that occurs in Virginia for which it was intended will provide a more balanced approach to multiple use management in the remaining approximately 80% of the Forest to which the Conservation Plan does not apply. Every 660' of a perennial stream (both sides) in a non T&E 6th Level HUC represents an additional 1 acre of multiple use management that may occur if only the existing GWNF SMZ's and VA State BMP's are used. Similarly, every 870' of ephemeral stream would represent an additional 1 acre of multiple use management. While this amount may seem small on an individual project basis, it is roughly estimated that adoption of the State BMP's in non-T&E watersheds could allow as much as 75 to 100 acres more vegetation management than if the more restrictive Conservation Plan Guidelines were in place.

Furthermore, the wider buffer strips required under the Conservation Plan are not likely to substantially increase the pools and LWD metrics that are of concern – at least not along perennial streams. Assume a 110' to 120' tree falls precisely perpendicular to the stream at the very edge of the buffer strip. Under the current Streamside Management Zone (SMZ) standard (66 feet), the top 40-50% would fall in or across the stream. Under the Conservation Plan SMZ (100 feet) the portion of that top becomes reduced as one moves from 66' to the outer limit until 10-15% of that tree falls in or across the stream. Thus a smaller and smaller portion and size of a tree top is potentially added to LWD as the SMZ becomes wider. The additional width on perennial streams does not result in a substantially large increase in LWD. This is not true of ephemeral streams; since there is no current SMZ applied to ephemerals in Virginia, adoption of the Conservation Plan in Virginia would result in significantly more LWD than current management provides for.

c. Tentative Options or Proposed Actions for Change

C-1. Adopt as standards and guidelines the Jefferson Forest Plan Riparian Corridor and Forest-wide Channeled Ephemeral standards (consistent with the Federally Listed Fish and Mussel Conservation Plan) into the plan and have them applicable across the entire George Washington National Forest.

C-2. Adopt as standards and guidelines appropriate updated State Best management Practices (BMP's) in the approximately 80% of the Forest that is not subject to the

Federally Listed Fish and Mussel Conservation Plan (Conservation Plan). Adopt as standards and guidelines the Jefferson Forest Plan Riparian Corridor and Forest-wide Channeled Ephemeral standards (consistent with the Federally Listed Fish and Mussel Conservation Plan) into the plan and have them applicable only to those 6th level HUC watersheds that contain federally listed fish and mussels.

C-3. Do nothing. Leave the GW riparian management area in place as is.

5. What are the Consequences of Not Changing?

There would be inconsistency with state BMP's within Virginia and West Virginia, inconsistency across the GWNF Forest between the watersheds covered under the Federally Listed Fish and Mussel Conservation Plan and those that are not, and inconsistency with the Revised Jefferson Forest Plan standards for riparian corridors and channeled ephemeral streams. This would result in inconsistency of riparian standards within and between districts, and potential confusion in Forest Plan implementation and loss of credibility with partners and the public.

Proposed Action

Propose Option C1.

Additional Information

Comments were received that indicated a need to expand or enhance the riparian guidelines beyond what was proposed with the Jefferson guidelines. In particular, was a publication from Wild Virginia entitled, The State of Our Water: Managing and Protecting the Drinking Water Resources of the George Washington National Forest. This report identified the need to examine the use of special guidelines in drinking water watersheds. The following summarizes additional examination of this topic.

The Jefferson Forest Plan Riparian Corridor and Forest-wide watershed direction and standards were developed to provide a variety of ecosystem services within a predominantly forested landscape. One of the underlying purposes for the creation of the National Forest System was to provide the ecosystem service of abundant, clean water (Dombeck 1999). Examples of other services related to riparian areas include, but are not limited to, maintaining streambank stability for the control of erosion and sedimentation, water temperature control for in-stream habitat, minimization of direct impacts by people and livestock, pollutant removal, and fisheries/wildlife habitat.

The Jefferson Forest Plan Riparian Corridor and Forest-wide watershed standards were developed after reviewing much literature and are generally consistent with buffer guidelines proposed by Wenger (1999). This includes a minimum 100 foot buffer on perennial streams, which increases with slope, includes the floodplain and wetlands, and buffers perennial, intermittent and ephemeral streams. Wenger stated that not only were these "defensible given the scientific literature", they provide adequate protection for stream corridors, including good control of sediment and other contaminants, maintenance of quality aquatic habitat, and some measure of terrestrial wildlife habitat.

In response to the above issue of maintaining water quality in drinking water watersheds, more recent literature was reviewed with a focus on watershed research and riparian buffers specific

to maintaining water quality. Most of this recent research revolved around nutrient removal effectiveness, specifically, nitrogen.

The 2003 Riparian Buffer Effectiveness Literature Review by Straughan Environmental Services, Inc. focused on the role riparian buffers play in preventing nitrogen from entering water. There are some discrepancies regarding width requirements for a buffer, but most agree on a 3 tier system and that the buffers should be no less than 75 feet wide on each side of the stream. Generally, Zone 1 is 15 feet and consists of trees to provide shade and control stream erosion. Zone 2 is 60 feet and the trees are selectively harvested to remove stores of nitrogen. Zone 3 is 20 feet and comprised of grass to slow water velocity and facilitate infiltration.

Sweeney et al. (2004) examined 16 streams in eastern Pennsylvania for Stroud Water Research Center to determine the differences in pollutant processing capacity between forested and non-forested segments. They found that not only do forest buffers prevent nonpoint source pollutants from entering small streams; they also enhance the in-stream processing of both nonpoint and point source pollutants, thereby reducing their downstream impact. This research shows that small to intermediate streams, which represent >90% of the total stream lengths in most watersheds, can play a major role in collecting, processing, and exporting nutrients to downstream rivers and estuaries.

A quantitative review of riparian buffer width guidelines from Canada and the United States (Lee et al. 2004), revealed that most jurisdictions (80%) allowed timber harvest within buffers. In addition, trends are (1) shifting toward more complicated guidelines based on site specific goals and land type, and (2) expanding to larger-scale, watershed planning of riparian areas.

The US Environmental Protection Agency (EPA) looked at riparian buffer width, vegetative cover, and nitrogen removal effectiveness in a 2005 review of current science and regulations. Nitrogen removal effectiveness varied widely among riparian zones, but the “most effective buffers are at least 30 meters wide composed of native forest, and are applied to all streams, including very small ones.” To maintain maximum long-term effectiveness, buffer integrity should be protected against soil compaction, loss of vegetation, and stream incision (disconnection from the floodplain). Maintaining buffers around stream headwaters will likely be most effective at maintaining overall watershed water quality.

Gunther et al. (2008) reviewed over 150 published scientific papers, written over the preceding forty years, on riparian and wetland buffer widths, on the subject of providing “ecosystem services”. The published studies were grouped by types of ecosystem services provided, buffer widths examined, and capacities for protection of water quality. For stream bank stability, temperature control, minimization of direct impacts, and pollutant removal capacities, substantial benefits are achieved within the first 50 feet of vegetative buffer width. Marginal increase in benefits may accrue when buffer widths are increased beyond 50 feet.

The 1993 landmark agreement between EPA and New York City (NYC) saved taxpayers billions of dollars by avoiding filtration while protecting drinking water quality through targeted land acquisition and management programs. It is often used as a model for watershed management and illustrates the economic importance of ecosystem services (Mates and Reyes 2006). NYC complies with Federal drinking water regulations by implementing a comprehensive watershed

protection program for the 1.26 million acres of land that supplies their water.
(<http://www.epa.gov/OWOW/watershed/ny/nycityfi.html>)

The crux of NYC's watershed protection program revolves around managing their land and water resources in six program areas.

(http://www.nyc.gov/html/dep/html/watershed_protection/html/resources.html)

- 1) *Farms* - The Watershed Agricultural Program is a voluntary partnership between the City and farmers to reduce nonpoint sources of agricultural pollution, particularly waterborne pathogens, nutrients and sediment.
- 2) *Streams* - Restoration of stream stability and ecosystem integrity is the primary goal of the Stream Management Program. The NY Department of Environmental Protection (DEP) encourages long-term stewardship of Catskill Mountain streams and floodplains by establishing partnerships with the region's Soil and Water Conservation Districts, landowners and other local agencies and municipalities.
- 3) *Forestry* - Forests cover more than $\frac{3}{4}$ of the NYC water supply watersheds, most privately owned and managed by thousands of individual landowners. In partnership with forest landowners, loggers and the forest industry, DEP supports a voluntary Watershed Forestry Program. Well-managed forests are not only a preferred open space land use for watershed protection; they're also a working landscape that supports the rural upstate economy. The use of New York State's Forestry Best Management Practices for Water Quality are encouraged, with particular focus on minimizing the impacts of logging equipment, protecting water quality at stream crossings, and reducing soil erosion from forest roads, skid trails and log landings.
(http://www.dec.ny.gov/docs/lands_forests_pdf/dlfbmpguide.pdf)
- 4) *Land Acquisition* - The purchase of sensitive, vacant lands within the eight county watershed is a critical component of the New York City's program to preserve water quality over the long-term.
- 5) *Land Management* - DEP water quality mission includes the proper management and stewardship of City-owned watershed lands and waters. Under an Access Permit system designated areas of New York City's watershed lands are available for hiking, fishing, deer hunting and other passive recreation activities compatible with water quality protection.
- 6) *Waterfowl* - To address the seasonal spikes in fecal coliform bacteria, DEP developed a management program to eliminate waterbirds -- geese, gulls, cormorants and ducks -- from select reservoirs using non-lethal measures.

During public comment for the revision, it was recommended the GWNF use New York City's (NYC) water quality protection measures as an example for potential policy and management objectives. In light of that suggestion, the NYC watershed protection program was explored.

The *Streams* and *Forestry* program areas most closely relate to Forest Service management activities and are described below. A summary of all the areas is included in the water quality section of the report.

Streams - Restoration of stream stability and ecosystem integrity is the primary goal of the Stream Management Program. The NY Department of Environmental Protection (DEP) encourages long-term stewardship of Catskill Mountain streams and floodplains by establishing partnerships with the region's Soil and Water Conservation Districts, landowners and other local

agencies and municipalities to address chronic and pervasive problems of Catskill Mountain streams, which are the source of 90% of the City's water supply. These issues include streambank and bed erosion, compromised water quality, flood hazard risks and fisheries habitat degradation. The catastrophic floods of January 1996, clearly demonstrated that the traditional approach of repairing isolated streambanks doesn't effectively address the real causes of stream instability.

DEP's program works to restore stream system stability and ecological integrity by:

- approaching stream management across watershed stream sub-basins, rather than at isolated erosion sites
- integrating multiple objectives, like minimizing flood hazards, increasing fish habitat and improving water quality;
- involving local communities, organizations and affected landowners
- using the science of river physical processes, called fluvial geomorphology (see below table for comparison with GWNF), as the basis for management recommendations.

Geomorphic Approach of NYC Stream Management Program	Proposed Desired Future Condition of Riparian Areas/Corridors for the GWNF
The geomorphic approach recognizes that the physical structure of stream channels governs habitat quality, fisheries' health, flood behavior, rates of erosion and, ultimately, water quality. The shape and size of a stream channel adapts itself to the amount of water and bedload it needs to carry. Within certain limits, the form, or morphology, of a stream is self-adjusting, self-stabilizing, self-sustaining. If a stream management plan exceeds those limits, however, the stream may remain unstable for a long time. (http://www.nyc.gov/html/dep/html/watershed_protection/html/)	Streams are in dynamic equilibrium; that is, stream systems normally function within natural seasonal ranges of flow, sediment movement, temperature, and other variables. The geomorphic conditions of some channels reflect the process of long-term adjustment from historic watershed disturbances (e.g., past intensive farming or logging practices). The combination of geomorphic and hydrologic processes creates a diverse physical environment, which, in turn, fosters biological diversity. The physical integrity of aquatic systems, stream banks and substrate, including shorelines and other components of habitat is intact and stable.

Forestry – Forests cover more than $\frac{3}{4}$ of the NYC water supply watersheds, most privately owned and managed by thousands of individual landowners. In partnership with forest landowners, loggers and the forest industry, DEP supports a voluntary Watershed Forestry Program. Well-managed forests are not only a preferred open space land use for watershed protection; they are also a working landscape that supports the rural upstate economy. The use of New York State's Forestry Best Management Practices for Water Quality are encouraged, with particular focus on minimizing the impacts of logging equipment, protecting water quality at stream crossings, and reducing soil erosion from forest roads, skid trails and log landings. (http://www.dec.ny.gov/docs/lands_forests_pdf/dlfbmpguide.pdf)

The following description of the Watershed Forestry Program is an excerpt from the book *Watershed Management for Potable Water Supply: Assessing the New York City Strategy*, Committee to Review the New York City Watershed Management Strategy, National Research Council ISBN: 0-309-51426-6, 564 pages, (2000):

The Watershed Forestry Program (WFP) was established in 1997 to improve the economic viability of forest land ownership and the forest products industry in ways compatible with water quality protection and sustainable forest management. Patterned after and affiliated with the Watershed Agricultural Program, the WFP was formed following the deliberations of a Watershed Forest Ad Hoc Task Force. The Task Force—comprised of foresters, local landowners, loggers, local and regional forest products industry representatives, representatives of nonprofit groups, and New York City and State officials—synthesized information about forests and forestry in the watershed region, identified problems and opportunities, and developed five overarching position statements for the WFP ([Table 9-5](#)).

The ideas, goals, and objectives set forth by the WFP correspond closely with other recent approaches, including the Massachusetts Metropolitan District Commission's management of the Quabbin Forest (Barten et al., 1998; MDC, 1995), the USDA Forest Service-sponsored Stewardship Incentive Program, and other contemporary examples (Bentley and Langbein, 1996; NRC, 1990, 1998). Although they are more comprehensive and sophisticated, most of the Task Force's findings and recommendations echo more general turn-of-the-century calls for conservation of forest resources.

TABLE 9-5 Position Statements of the Watershed Forestry *Ad Hoc* Task Force and Corresponding Policy Recommendations^a

Position Statements	Policy Recommendations
1. Well-managed forests provide the most beneficial land cover for water quality protection.	<ul style="list-style-type: none"> • Educate the public about the linkages between forests, forestry, water quality, and rural economies. • Use conservation easements that allow for traditional uses and maintain undeveloped land.
2. Existing forest management activities are a negligible nonpoint source of pollution; however more extensive use of Best Management Practices (BMPs) will further reduce sediment and nutrient loading from forest management activities.	<ul style="list-style-type: none"> • Expand the logger training and certification program. • Develop a user-friendly BMP field manual tailored to watershed conditions. • Expand forest management outreach and plan development with landowners. • Conduct a watershedwide, posttimber harvest survey to assess the effectiveness of New York State's timber-harvesting guidelines. • Develop regulatory and economic incentives to improve BMP compliance and on-the-ground performance.

3. High property taxes discourage stewardship of private forest land.	<ul style="list-style-type: none"> • Reform New York State forest tax law (RPTL 480-a) to a current-use strategy equivalent to that of neighboring states with reimbursement to local governments. • Develop alternative or supplemental funding sources for local governments and school districts (in addition to local property tax revenue). • Establish a system of incentives to encourage owners of smaller parcels (<50 acres) to maintain their holdings.
4. Retention and growth of primary and secondary forest products manufacturing are essential to a healthy forest-based economy, forest land retention, natural resource protection, and sound forest conservation and management.	<ul style="list-style-type: none"> • Provide technical and financial assistance to forest landowners interested in long-term management to ensure a continuous supply of high-quality timber for local manufacturing. • Foster an improved business climate to develop and sustain local forest-based industry. • Promote the inclusion of forestry and the forest products industry in economic development studies.
5. Existing public forest lands should provide a model for sound resource management that complements private stewardship.	• NYS DEC and NYC DEP forest lands should, where appropriate, serve as examples of sustainable forest management.
<p>^a Position statements are direct quotations from the original source while policy recommendations are paraphrased.</p> <p>Source: WFAHTF (1996).</p>	

In summary, the NYC strategy views a managed forest landscape as the preferred land use. It promotes active management within fixed-width setbacks to achieve the pollutant removal efficiencies attributed to buffer zones. The distance of the setback depends on land use and the type of waterbody. There are no prescribed setbacks for forestry activities in the Memorandum of Agreement between EPA and NYC; instead they deal with uses such as septic tanks, landfills, impervious surfaces and underground oil storage. A 100 ft setback was used to model removal effectiveness for various pollutants (National Research Council 2000, p 442). The setback distances in the NYC watersheds are similar to, or greater than, those found in other locations (National Research Council 2000, p 462).

Setbacks, in contrast with buffer zones, are simply prescribed distances between pollutant sources and a resource or aquatic ecosystem that needs protection. Only if a setback is subject to management or natural preservation can it be considered a “buffer” that reliably insulates ecosystems and resources from nonpoint source pollution (National Research Council 2000, p 427). Setbacks must be naturally regenerated or planted with the appropriate vegetation for retaining nutrients, sediment, and other pollutants. Forested setbacks are recognized as the most effective buffers, in most cases. If setbacks are managed as buffers, they should be managed as described in the USDA three-zone buffer specification, and consideration should be given to periodic vegetation harvesting in Zones 2 and 3 (National Research Council 2000, p 462). The three-zones are described as:

Zone 1 – Undisturbed forest along the water edge for shade, cover, food web functions, and bank stability.

Zone 2 – Managed forest for nonpoint source pollutant assimilation.

Zone 3 – Vegetated area for runoff control (National Research Council 2000, p 431).

Within the NYC Watershed Forestry Program, riparian forest buffers are subject to special operating restrictions, often specified by state forest practice acts, to minimize undesirable changes in site conditions. The most important restriction is the prohibition of direct access by heavy equipment. Selective harvesting of trees within zones 2 and 3 can and should occur. However, logs can only be winched on a steel cable to a machine located outside of the buffer or removed by a mechanical harvester with a hydraulic boom. Restricting access by heavy equipment virtually eliminates the soil disturbance and compaction responsible for generating and conveying nonpoint source pollution. Except for the restriction on equipment access, the transition between the harvest unit and the riparian forest buffer should, by design, be gradual and indistinct. Basic silvicultural practices to maintain or enhance the health, vigor, and growth rate of trees should be implemented in the riparian forest buffer (National Research Council 2000, p 436-7). New York State Forestry BMP's are encouraged to reduce erosion and prevent sedimentation to streams. The following table compares the NY State Forestry BMP and the proposed GWNF riparian management.

	NY State Forestry BMPs	GWNF proposed riparian management*																						
Riparian buffers	Buffer strips are filter strips between streams and soil disturbance (NY BMP, p 65).	Pre-defined widths to facilitate implementation and analysis, the actual corridor widths can be changed on a site specific basis through IDT input. The corridors are managed for riparian dependant resources (water quality, stream channel stability, aquatic and riparian biota).																						
		The portion of the corridor that is extended based on slope is managed as a vehicle exclusion zone and filter strip, and does not prohibit timber management. The proposed Riparian Corridor management was developed to easily implement direction on the ground, and also to recognize the variability in riparian systems.																						
	<table><tr><td>Slope (%)</td><td>Recommended filter (ft)</td></tr><tr><td>0-10</td><td>50</td></tr><tr><td>11-20</td><td>51-70</td></tr><tr><td>21-40</td><td>71-110</td></tr><tr><td>41-70</td><td>111-150</td></tr></table>	Slope (%)	Recommended filter (ft)	0-10	50	11-20	51-70	21-40	71-110	41-70	111-150	<table><tr><td>Perennial</td><td>Slope (%)</td><td>Riparian Corridor (ft)</td></tr><tr><td></td><td>0-10</td><td>100</td></tr><tr><td></td><td>11-45</td><td>125</td></tr><tr><td></td><td>45+</td><td>150</td></tr></table>	Perennial	Slope (%)	Riparian Corridor (ft)		0-10	100		11-45	125		45+	150
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Channeled Ephemeral	Slope (%)	Riparian Corridor (ft)																						
	all	25																						

* Management direction for the 25 foot corridor on either side of a channeled ephemeral stream does not prohibit timber management, but does focus attention on the importance of these streams, and their relationship to the overall hydrologic system.

In summary, the Jefferson Riparian Corridor and Forest-wide watershed standards are consistent with the Federally Listed Threatened and Endangered Mussel and Fish Conservation Plan, and were developed to focus on riparian resources and provide protection for all streams, lakes, and wetlands across the forest. Following review of additional research, they are generally consistent with recommendations for maintenance of Ecosystem Services as defined as “the processes by which the environment produces resources, such as clean water” (Gunther et al. 2008). In addition, they exceed the applicable watershed measures implemented by NYC, as approved by EPA for maintenance of drinking water standards. Accepting the proposal to

adopt these measures for the George Washington National Forest Plan Revision would afford similar protection to all water resources on the Forest.

References

Dombeck, M. 1999. The United States Forest Service: The World's Largest Water Company. Outdoor Writers Association of America Conference, Sioux Falls, South Dakota, June 21.

Gunther, R., C.P. Kilgore, and R. Rupprecht. 2008. Riparian and Wetland Buffers: A Review of Current Literature, with Recommendations for Determining Widths for Providing Certain Ecosystem Services. American Water Resource Association, Summer Specialty Conference, Virginia Beach, June 30-July 2.

Lee, P., C. Smith, and S. Boutin. 2004. Quantitative review of riparian buffer width guidelines from Canada and the United States. *Journal of Environmental Management*, 70, 165-180.

Mates, W.J. and J.L. Reyes. 2006. The Economic Value of New Jersey State Parks and Forests, New Jersey Department of Environmental Protection Division of Science, Research & Technology, Issued June 2004, Revised version issued November 2006.

Mayer, P., S. Reynolds Jr., T. Canfield, and M. McCutchen. 2005. Riparian Buffer Width, Vegetative Cover, and Nitrogen Removal Effectiveness: A Review of Current Science and Regulations. U.S. Environmental Protection Agency, National Risk Management Research Laboratory, Office of Research and Development, Cincinnati, Ohio. EPA/600/R-05/118.

Straughan Environmental Services, Inc. 2003. Riparian Buffer Effectiveness Literature Review. Prepared for Maryland Department of Natural Resources, Power Plant Research Program, Annapolis, Maryland.

Sweeney, B., T. Bott, J. Jackson, L. Kaplan, J.D. Newbold, L. Standley, W.C. Hession, and R. Horwitz. 2004. Riparian deforestation, stream narrowing, and loss of stream ecosystem services. *Stroud Water Research Center. Proceedings of the National Academy of Sciences*, 101:39, 14132-14137.

Wenger, S. 1999. A Review of the Scientific Literature on Riparian Buffer Width, Extent, and Vegetation. Office of Public Service & Outreach, Institute of Ecology, University of Georgia, Athens. Revised version March 5.

The 1993 Plan did not consider beavers and the usefulness of beavers in creating and maintaining habitat and restoring riparian areas. The North American beaver (*Castor canadensis*) is a semi-aquatic mammal occurring in rivers, streams, lakes and wetlands across North America. Beavers are unique in their ability to create and modify their habitat by building dams. Because they exert such a strong influence on aquatic and riparian communities, the beaver is considered a keystone species (Boyle and Owens, 2007).

Beavers alter ecosystem hydrology, biogeochemistry, vegetation, and productivity with consequent effects on the plant, vertebrate, and invertebrate populations that occupy beaver-

modified landscapes. Their impoundments trap fine textured sediments that act as water storage reservoirs, resulting in slow, sustained discharge that maintains streamflows during dry periods; afford protection from flooding of downstream areas; and produce a raised water table that enhances riparian zones. Additionally, beaver habitat modifications can reduce pollution and improve water quality in aquatic ecosystems, by trapping sediment and nutrients, reducing downstream turbidity, and purifying water from acidification and other non-point source pollutants.

The capability of beavers to store water, trap sediment, reduce erosion, and enhance riparian vegetation can be used as a management tool to restore degraded aquatic and riparian ecosystems. Beavers are a habitat-modifying species and play a pivotal role in influencing community structure in many riparian and wetland systems.

Beaver altered landscapes can also increase open wetland habitat and open terrestrial habitat that is used by many other species. The cycle of beaver dam construction, pond formation, pond abandonment, and subsequent pond reoccupation creates unique habitat in otherwise wooded landscapes. The various successional stages created by beavers are important for ruffed grouse, woodcock, waterfowl, and a variety of neo-tropical migratory songbirds. Beaver created habitat increases bird species richness and diversity.

Benefits of beaver activity:

- Wetland creation
- Groundwater recharge
- Water table elevation
- Sediment and organic matter retention
- Mitigation of high flows – reduction of stream kinetic energy, erosion, flooding
- Mitigation of low summer flows – some intermittent streams can become perennial
- Reduced carbon turnover rate (24 years in a riffle vs 161 years for a beaver pond)
- Raise water pH, ANC, N (N-fixing bacteria in sediments), NH₄
- Reduce SO₂, Al, NO₃
- Wildlife habitat
 - Increase aquatic productivity
 - Fish
 - Amphibians
 - Reptiles
 - Bats
 - Wildlife
 - Mink
 - Otter

- Muskrat
 - Small mammal density increases
 - Deer – browsing and bedding
 - Bird species richness and diversity increase
- Waterfowl –nesting and brooding habitat, feeding and resting during migration
- Insects – odonate species richness and diversity increases
- Aquatic and wetland plants – riparian species richness is increased, esp. in meadows
- Early successional species
 - Grouse
 - Woodcock
 - Songbirds
- Creation of spatial and temporal landscape mosaic –
 - increase landscape heterogeneity
 - Increase in landscape species diversity
 - Beaver ponds
 - Increased riparian zone
 - Mud flats
 - Beaver meadows

The primary conservation concerns are to maintain existing beaver populations and to restore beaver populations to unoccupied habitat where appropriate to take advantage of their capability to restore and strengthen the ecological integrity of aquatic and riparian ecosystems.

6. Recommendations for Plan Revision

Adopt as standards and guidelines the Jefferson Forest Plan Riparian Corridor and Forest-wide Channeled Ephemeral standards (consistent with the Federally Listed Fish and Mussel Conservation Plan) into the plan and have them applicable across the entire George Washington National Forest.

The Plan should acknowledge the importance of beavers in restoration of riparian ecosystems and develop plan components to enhance their populations.

E. Management Indicator Species

1. What was the Plan Striving For?

Management Indicator Species (MIS) selected for the 1986 Forest Plan included black bear, wild turkey, white-tailed deer, common flicker, and pileated woodpecker. In order to adequately monitor the effects of management practices on biological communities, plant and animal

populations, and ultimately biological diversity, additional MIS were selected for the 1993 Revised Plan. These were selected to measure the effects of forest fragmentation, gypsy moth defoliation, and management activities as well as to represent all forest ecosystems.

Management indicator species selected for the 1993 Revised Plan were:

- Demand Species: white-tailed deer, black bear, and wild turkey.
- Ecological Indicators: cave dwelling bats, brown-headed cowbird, oven bird, worm eating warbler, Cow Knob salamander, tiger salamander, brook trout, sunfish family (centrarchid), common flicker, pileated woodpecker, yellow pine community (pitch, table mountain, Virginia and shortleaf pine), old growth forest types.
- Threatened and Endangered Species: Indiana bat, northern flying squirrel, peregrine falcon, bald eagle, James Spiny mussel, shale barren rockcress, swamp pink, northeastern bulrush.

The rationale for the selection of MIS may be found in Appendix J of the FEIS. MIS were used to monitor the Implementation of the Revised Plan, and the effects on diversity and population viability of all native and desirable non-native plants and animals. MIS were to determine if the Revised Plan was achieving the desired future condition across the Forest and in each management area.

Monitoring of MIS included individual species, but these species were not always monitored on a single species basis. Rather, monitoring of groups of species or biological communities often more accurately described diversity, population viability, and changes as a result of management activities. The desired condition for the Revised Plan was to provide suitable habitat to maintain viable populations of all native and desirable non-native plants and animals. The trends for the current species are valuable information for identifying any need for change in management direction. These trends are reported in other sections of this document.

3. Did Management Activities Move the Forest towards the Desired Future condition?

See other sections for the results for individual MIS.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? A complete analysis of MIS was done for the Jefferson Forest Plan. Since the Jefferson and George Washington are administratively combined and share common issues and management direction, it would be more efficient to have the same MIS. The exception would be that the Peaks of Otter salamander occurs only on the Jefferson NF and the Cow Knob salamander occurs only on the GWNF.

5. Recommendations for Plan Revision

Use the following species as MIS for the Plan:

Common Name	Scientific Name	Primary reason(s) for selection
Pileated woodpecker	<i>Dryocopus pileatus</i>	To help indicate the effects of management on snag dependent wildlife.
Ovenbird	<i>Seiurus aurocapillus</i>	To help indicate the effects of management on mature forest interior species.

Common Name	Scientific Name	Primary reason(s) for selection
Chestnut-sided warbler	<i>Dendroica pensylvanica</i>	To help indicate the effects of management on high-elevation early-successional species.
Acadian flycatcher	<i>Empidonax virescens</i>	To help indicate the effects of management on mature riparian forest dependent species.
Eastern towhee	<i>Pipilo erythrophthalmus</i>	To help indicate the effects of management on early-successional forest wildlife.
Black bear	<i>Ursus americanus</i>	To help indicate the effects of management on meeting hunting demand for this species.
Wild turkey	<i>Melagris gallopavo</i>	To help indicate the effects of management on meeting hunting demand for this species.
White-tailed deer	<i>Odocoileus virginianus</i>	To help indicate the effects of management on meeting hunting demand for this species.
Hooded warbler	<i>Wilsonia citrina</i>	To help indicate the effects of management on mid- and late-successional mesic deciduous forest species. This includes mixed mesophytic and oak and oak-pine forests.
Scarlet Tanager	<i>Piranga olivacea</i>	To help indicate the effects of management on species found in drier mid- and late-successional oak and oak-pine forests.
Pine warbler	<i>Dendroica pinus</i>	To help indicate the effects of management on mid- and late-successional pine and pine-oak forest species.
Wild trout (brook trout, rainbow trout, brown trout)	<i>Salvelinus fontinalis</i> , <i>Oncorhynchus mykiss</i> , <i>Salmo trutta</i>	To help indicate the effects of management on cold-water streams and meeting fishing demand for these species.
Cow Knob salamander	<i>Plethodon punctatus</i>	Endemic sensitive species found only on the GWNF

F. Threatened, Endangered, and Sensitive (TES) Species

1. What was the Plan Striving For?

The 1993 Revised Plan provides habitat for the continued existence of all populations of threatened, endangered, and sensitive plant and animal species in the Forest. The habitats and populations of threatened, endangered and sensitive species throughout the Forest are protected and maintained as appropriate. Many TES species are tied to unique habitats and Special Biological Areas. See the Unique Natural Community and MIS sections of the report for further discussion.

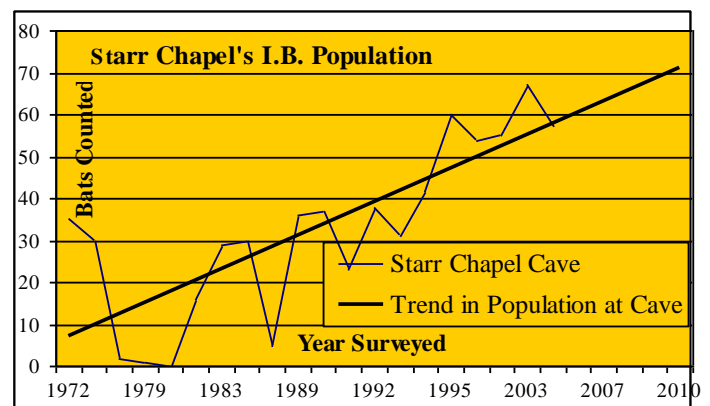
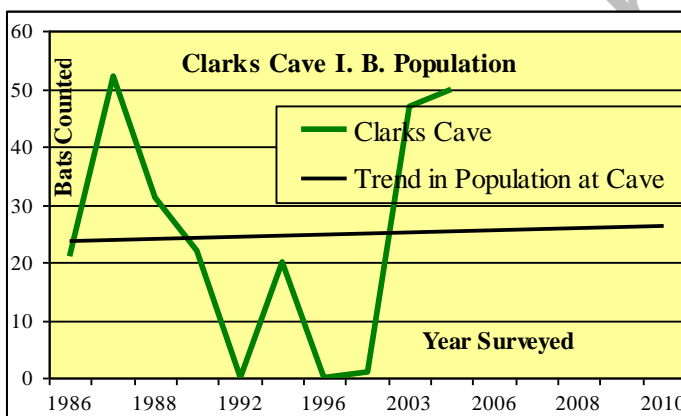
Appendix L of the 1993 Revised Plan contains charts showing which TES species occur or are likely to occur in the Forest; their global and state rankings; their occurrences by ranger districts and management areas; and the generalized type of habitat appropriate for the species.

2. Where is the Plan Now?

INDIANA BAT – The Indiana bat was individually selected because it is a federally listed endangered species and there is direct interest in its population levels based on the fact that it is generally a woodland and forest dwelling bat during the non-hibernation months that may be affected during some management activities.

Specific to the Indiana bat, habitat objectives are presented in a Forest Plan amendment dated March 12, 1998. While these objectives were adopted for conservation and recovery of the Indiana bat on the Forest as a result of formal consultation with the U.S. Fish and Wildlife Service (USFWS), they benefit all other cave dwelling bats as well. The objectives are presented as standards in the Plan Amendment and they provide for: cave gating to prevent human disturbance, cave and buffer area land acquisition (on a willing seller basis), eliminating or limiting types of disturbances near caves/roost sites/maternity sites, timber activities to leave all shagbark hickories and a minimum of six snag or cavity trees per acre >9" dbh, at least 60% of all forest types to be maintained over 70 years of age and a minimum of 40% acreage of CISC Forest Types 53 (white oak-red oak-hickory) and 56 (yellow poplar-white oak-red oak) to be maintained at an age >80 years old, encouraging prescribed fire to provide for open understory foraging corridors, and creating drinking water sources for bats in areas greater than 0.6 miles from open water (Indiana bat EA, page 1-83 and DN page 1-6).

This amendment also showed the seven cave protection areas for the bat, three areas on the Jefferson and four on the GW. The four areas on the GW are: [Starr Chapel](#), [Clark's](#), [Hupman's Saltpetre](#), and [Mountain Grove Saltpetre](#) Cave Protection areas. However, the GW Forest Plan does not explicitly show these areas, whereas the three areas on the Jefferson were explicitly shown as management areas when



the Jefferson Plan was revised in 2004. Likewise, the Jefferson Forest Plan provided the same direction through use of specific allocations, whereas, in the GW Plan, this same direction was provided only in the forestwide direction of the Forest Plan.

Within Starr Chapel Cave's Protection Areas, land has been acquired since the time of the amendment.

VIRGINIA NORTHERN FLYING SQUIRREL - The Virginia northern flying squirrel (*Glaucomys sabrinus fuscus*) was listed as endangered in 1985 by the USFWS. This squirrel was selected for the George Washington Forest Plan because it is a federally endangered species and therefore there is direct interest in its population status. The species occurs in high-elevation forests in the southern

Appalachians, being restricted to mature red spruce/northern hardwood areas (Laurel Fork) on the GWNF. This area is immediately adjacent to a large area of NFS habitat on the Monongahela National Forest, and is a part of the Spruce Knob/Laurel Fork Geographic Recovery Area for *G. s. fuscus*. At the time the first Plan revision was signed (1993), monitoring estimated that there were fewer than 20 northern flying squirrels (NFS) on the Forest (all in the Laurel Fork area). Northern flying squirrels have been monitored in the Laurel Fork area between 1986 and 2004. Analysis results suggest an overall low but stable trend for northern flying squirrel populations on the GWNF. Flying squirrels were captured and released in the Laurel Fork area between 1986 and 1996 to obtain population trend data. The number of squirrels captured ranged from 0 to six. No squirrels were captured in six out of the ten years of trapping. In 2004, one northern flying squirrel was captured, the first in several years of monitoring. Habitat trends for mature spruce/northern hardwood in the Laurel Fork area are estimated to be stable (around 71 acres). The GWNF encompasses a single population of the northern flying squirrel that is disjunct from its almost contiguous boreal distribution across northern North America, the Rocky Mountains, and New England. This species is inherently rare and not naturally well distributed across the Forest, due to its dependence on the spruce-fir/northern hardwood forest type. Northern flying squirrel populations are expected to remain relatively stable in the near future. Current management provides for ecological conditions capable to maintain the flying squirrel population, considering its limited distribution and abundance.

On August 15, 2008 the U.S. Fish & Wildlife Service removed the Virginia northern flying squirrel from the list of Threatened and Endangered wildlife due to recovery. This species is now considered to be a sensitive species on the Forest.

PEREGRINE FALCON – The peregrine falcon (*Falco peregrinus*) was selected because it was a federally threatened species (GWNF FEIS Appendix page J-12). It was, however, de-listed by the USFWS on August 8, 1999 (64 FR 46541 to 46558). It's a species whose habitat may be influenced by management activities and requires specialized nesting habitat (cliffs). The amount and distribution of isolated cliffs on the Forest are most likely to be influenced by management activities associated with allowing recreational climbing in and around cliff areas that were used as hack sites in the early and late 1980's to release fledgling falcons. In addition, prescribed fire may enhance suitable habitat by controlling vegetation encroachment on suitable cliff areas (NatureServe 2009). From 1988 through 1991, a total of 59 young peregrines were "hacked" onto the GWNF (hacking is a process whereby young raptors are trained to feed and to fly). The purpose of the hacking was to restore a breeding population of peregrines to the GWNF, as the birds often return to breed in the area where they fledged. None of the hacked birds returned to the GWNF to nest, although banding records show that several of these birds have shown up both north and south of Virginia. In 2005 and 2006, a pair of peregrines nested successfully in a remote section of Shenandoah National Park. In 2000, a nesting pair of peregrine falcons fledged two young in the vicinity of Lost River State Park, just over the state line in West Virginia. Monitoring results indicate there are no resident peregrine falcons on the Forest. Based on the results of GWNF monitoring and evaluation, ecological conditions on the Forest are sufficient to contribute to species viability (persistence over time), if and when peregrine falcons again return to the GWNF (NatureServe 2009).

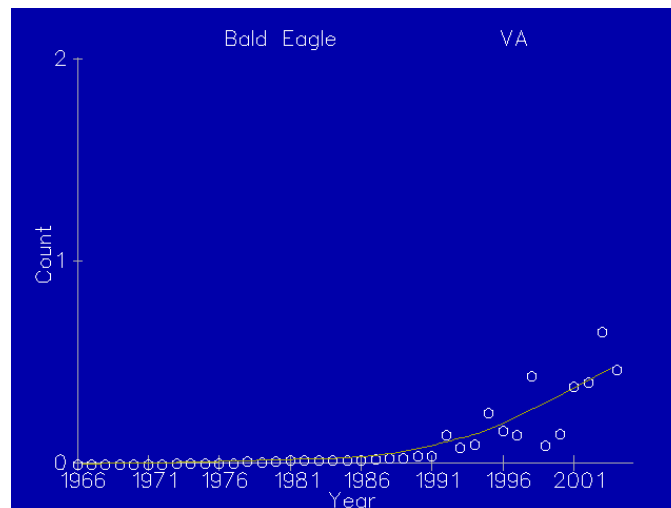
BALD EAGLE - The bald eagle (*Haliaeetus leucocephalus*) was selected by the GWNF Plan because it is a federally endangered species (GWNF FEIS Appendix page J-12). In June of 2007 the U.S. Fish and Wildlife Service removed the bald eagle from the list of Threatened and Endangered wildlife due to recovery. This species is now considered to be a sensitive species on the Forest.

The bald eagle prefers large bodies of water (lakes or larger rivers) adjacent to forested areas with minimal disturbance to its nesting sites. Several bald eagle occurrences are noted on the GWNF annually, however, these represent transient individuals. Currently, active bald eagle nests are known on private land in the Lake Moomaw area (North River RD and Warm Springs RD), near the Jackson

River and Virginia Power (VEPCO) reservoir (Warm Springs Ranger District), and on Forest Service land located on the Dry River and Lee Ranger Districts. Habitat for bald eagles on the National Forests is relatively insignificant when compared to the quantity and quality of habitat in the Chesapeake Bay and the Virginia coastline. USGS Breeding Bird Survey data indicates an overall increasing trend for bald eagle populations in the state, which will likely result in increased use by transient birds and increase probability of future nesting on the GWNF. Bald eagles have not been documented on the avian point counts from the GWJNF's.

Trend in BBS Data of Bald Eagle across the State of Virginia, 1966 To 2005.

Source: <http://www.mbr-pwrc.usgs.gov/bbs/bbs.html>



The amount of nesting, roosting, and foraging habitat suitable for bald eagles on the GWNF is limited. Lakes such as Moomaw and Sherando, or rivers such as the James, the Calfpasture, and the Shenandoah could provide habitat, and transient eagles may appear at these locations occasionally. When nests are found, protection measures outlined by the USFWS are followed. Based on the results of GWNF monitoring and evaluation, ecological conditions on the Forest are sufficient to contribute to species viability (persistence over time). Overall, factors outside the authority of this agency affect the viability of the eagle (USF&WS 2007).

JAMES SPINYMUSSEL - As documented in Appendix G of the Monitoring and Evaluation (M&E) Report (2004), several new occurrences of the James Spiny mussel were located from surveys conducted on streams in Bath County in 2000-2004. The James Spiny mussel does occur in watersheds that contain NFS land and occurs both upstream and downstream from the Forest. Current Forest management provides for water quantity and quality that contributes to the persistence of mussel populations.

Overall, viability remains a concern for the James Spiny mussel on the GWNF, yet management has little ability to affect its overall viability. Factors outside the authority of this agency affect the viability of the James Spiny mussel.

The Forest is currently working with the US Fish and Wildlife Service and VDGIF to locate James Spiny mussel populations on National Forest and habitat suitable for augmentation.

SHALE BARREN ROCKCRESS - The Plan created Special Biological Areas (SBAs) to protect a number of shale barrens and the shale barren rockcress that occurred on them. Appendix G of the 2004 M&E Report states: "Habitat where shale barren rockcress occurs is protected either by designation as a Special Biological Area or during the project-level Biological Evaluations prior to project decision and

implementation. Habitat for this species on the Forest is stable.” Between 1994 and 1998 field surveys of shale barrens were conducted on the Forest by DCR-DNH. As a result a number of new SBAs have been proposed to protect both the rare shale barren communities and the shale barren rockcress.

SWAMP PINK – The Plan allocates most of the habitat for swamp pink to Wilderness or to SBAs. Because the majority of the Forest’s swamp pink habitat is in Wilderness or Special Biological Areas it is being conserved and protected from potentially damaging activities. Basically, natural processes are operating in these areas. The habitat trend for this species is stable or increasing. Swamp pink populations that are currently in MA 16 (Early Successional Habitat) along the Coal Road would benefit from a change to a special biological area designation that allows for mature forest and lower stems densities.

NORTHEASTERN BULRUSH - At the time of the 1993 GWNF Plan there were 2 possible occurrences on the Forest. One of the populations is on a 40-acre tract on Potts Mountain that was acquired by the U.S. Forest Service in 1995. This site is managed as a Special Biological Area. The other is in the Maple Springs Special Biological Area, however, the record of collection there has not been verified and it is doubtful northeastern bulrush occurs here. As of August 1996, inventories by Virginia Division of Natural Heritage (VDNH) discovered a new occurrence (Morning Knob). An additional site is in West Virginia at Pond Run Pond on the Forest.

Summary

See the discussion in the Unique Natural Community section for trends in unique habitats.

The Forest is involved in several endeavors to prevent the listing of species as threatened, endangered or sensitive, through cooperative efforts at defining management strategies to manage habitat so their populations would not decline. These endeavors include the endemic Cow Knob Salamander.

The Forest also developed a Federally Listed Fish and Mussel Conservation Plan cooperatively with the USFWS and state partners. The intent was to provide pro-active and consistent management direction for watersheds that contained T&E fish and mussels. Additionally, these conservation plan standards are consistent with the Revised Jefferson Forest Plan Riparian corridor standards. They are currently applied to only 6th level watersheds on the George Washington National Forest.

3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? The Plan needs to incorporate new information about threatened, endangered and sensitive species.

c. Tentative Options or Proposed Actions for Change

See also the discussion of riparian areas and special biological areas elsewhere in this report.

C-1. Modify the Forest Plan by:

a) Creating new SBA(s) to protect the shale barren rockcress.

b) Creating new SBA(s) to protect the Northeastern bulrush.

- c) Make an administrative change by delineating the Primary and Secondary Cave Protection areas (as shown in the Forest's 1998 Indiana Bat Amendment) and correspondingly, adopt the Jefferson Forest Plan direction for these special areas.

C-2. Do Nothing.

5. What are the Consequences of Not Changing?

New locations of federally endangered or threatened species may not be protected. The Indiana bat would still be protected.

Proposed Action

Propose Option C1.

6. Recommendations for Plan Revision

Create new SBA(s) to protect the shale barren rockcress and the Northeastern bulrush (See SBA map). Delineate the Primary and Secondary Cave Protection areas (as shown in the Forest's 1998 Indiana Bat Amendment) and correspondingly, adopt the Jefferson Forest Plan direction for these special areas.

G. Unique Natural Communities (Special Biological Areas)

1. What was the Plan Striving For?

The current Plan allocates 70,000 acres to Management Area 4 (Special Interest Areas or SIAs) to manage and protect 38 Biological SIAs, two Geological SIAs, 12 Historic SIAs, one research natural area and the Shenandoah Mountain Crest SIA, containing special habitat for the Cow Knob Salamander. These areas have been identified by the Forest, state natural heritage programs and wildlife agencies, and the USDI Fish & Wildlife Service as deserving special protection and appropriate management.

Six of these areas (Big Levels, Laurel Run, Maple Flats, Shale Barren Complex, Skidmore, and Slabcamp/Bearwallow) were recommended for further study and possible classification as Research Natural Areas.

2. Where is the Plan Now?

Since the current Plan was implemented potential new [shale barrens](#) and [SBAs](#) have been identified by the Virginia Natural Heritage Program in reports. Likewise, the respective state natural heritage programs have done inventories of unique areas since the Plan was first revised in 1993. All of this information was reviewed. This review shows that about 13 existing areas should be expanded. There are also 84 new natural communities that are not currently designated SBAs. However, a lot of these areas are inside Congressionally-designated Wilderness or Mt. Pleasant National Scenic Area or other unique areas of the Forest such as the existing Cow Knob Salamander Conservation area.

No area from the 1993 Plan has been nominated to the Chief of the Forest Service to be designated a Research Natural Area.

Review of MIS related to unique natural communities

CAVE DWELLING BATS – Cave dwelling bats were selected as a MIS because they are dependent on relatively undisturbed caves, a habitat element important for maintaining the wide array of animal diversity found on the Forest (GWNF FEIS, Appendix page J-14). Populations of cave dwelling bats are believed to reflect effectiveness of measures to protect these habitats (i.e. caves) from disturbance (primarily human-induced). For a discussion on the Indiana bat, see the Threatened and Endangered Species discussion elsewhere in this report.

As documented in Appendix G of the latest annual M&E report, recent surveys have shown a steady to increasing trend for cave dwelling bats, including the endangered Indiana bat, on the GWNF. Analysis of cave surveys conducted semi-annually in cooperation with VDGIF suggest an overall steady to increasing trend for cave dwelling bats both on and near the GWNF. The Forest is currently working with the US Fish and Wildlife Service and VDGIF to manage habitat suitable for bat use on the Forest including caves, roosting and foraging.

Bat species known to occur in caves on or near the GWNF include: big brown bat, northern myotis (formerly Keen's myotis), eastern small-footed bat, little brown bat, eastern pipistrelle, Virginia big-eared bat, and Indiana bat. Some species such as pipistrelles, gray bats, and Virginia big-eared bats use caves year round. Others, such as the big brown bat and Indiana bat use caves only from late fall to early spring (while in hibernation), and then spend summer days under the bark of trees or in buildings, foraging at night.

The number of caves on the GWNF is finite. In Virginia there are over 3,200 caves with more than 97% on private land according to the Cave & Karst Program of VDCR-DNH. Currently there are 42 caves known to occur on the GWNF. Not all caves on NFS land are suitable for bats and fewer still are suitable for certain bat species. The Forest Service is looking for opportunities to acquire or assist with management of caves adjacent to NFS land. Therefore, while the trend in cave numbers on the Forest is stable, that number may increase through acquisition of known caves and discovery of new caves. The trend for habitat conditions surrounding cave entrances is that of an aging ("maturing") late successional forest. This trend is due to the fact that forested acreage surrounding cave entrances is protected from forest management disturbances. At the same time food sources (i.e. insects) are experiencing population fluctuations and shifts in species diversity associated with an aging forest and limited management activities.

Winter surveys are conducted in four caves that occur on (Mountain Grove Saltpetre Cave and Starr Chapel Cave) or near (Clark's Cave and Hupman's Saltpetre Cave) the GWNF. Personnel of the Non-game & Endangered Species Section of the VDGIF, in cooperation with the Forest Service, conduct these surveys. These surveys are not conducted every year in order to minimize disturbance to the bats. Based on individual bat counts in caves on the GWNF for the latest survey (2005) bat populations are estimated at 6,096 individuals in three caves, including 107 Indiana bats. Results of these surveys suggest a continuing overall stable to increasing trend for cave dwelling bat populations on the GWNF. Fluctuations can be seen in year-to-year numbers for a given species and for the total cave count. These are due to one or several factors such as differences in fall and winter weather from year-to-year causing bats to move to new cave locations or change their positions within a cave to a location on the cave wall or ceiling where they cannot be easily counted or even missed entirely. Other causes for differences between years include normal population fluctuations, observer bias, differences in cave survey techniques, and cave inaccessibility due to deep snow or ice preventing access during the survey period.

Populations of cave dwelling bats reflect more than management of caves and NFS land since they forage widely and some species migrate. For cave dwelling bats the trend in population numbers (stable to slowly increasing) reflect habitat conditions (an aging forest and cave stability) subject to management activities designed to maintain and/or enhance bat habitat (cave gating and foraging habitat enhancement through prescribed fire and modified timber harvest techniques).

Bat populations reflect more than cave management, or even NFS land management, as some species migrate widely. Cave protection measures appear adequate to protect this portion of the species life

history and therefore National Forest management is contributing, to the extent possible, to maintain species viability. While there is uncertainty about some bat population levels range-wide in North America, the bat populations on the Forest are expected to remain relatively stable or increase in the near future.

COW KNOB SALAMANDER – The Plan created the Shenandoah Mountain Crest Special Interest Area in part to protect the known range of the Cow Knob salamander. As documented in Appendix G of the annual M&E reports the habitat trend is one of an aging forest that benefits Cow Knob salamanders and should lead to a stable or increasing population. Recent field surveys (2002-2003) discovered the Cow Knob salamander outside the current range south along Shenandoah Mountain to Hardscrabble Knob. These areas will be managed under the terms of the existing Conservation Agreement and Conservation Assessment. The agency intends to discuss these newly discovered areas with the Salamander's Conservation Team, which includes representatives from the Virginia Department of Game and Inland Fisheries, Virginia Division of Natural Heritage, West Virginia Department of Natural Resources, and the U.S. Fish and Wildlife Service. At this time, the agency is postponing making any proposal to expand the existing Cow Knob Salamander Special Biological Area until it meets with the Conservation Team.

EASTER TIGER SALAMANDER - The Plan created the Maple Flats SBA in part to protect the Easter tiger salamander. Appendix G of the 2004 M&E report states "Delineation of the Maple Flats Special Biological Area containing the eastern tiger salamander appears to have encompassed much, if not all, habitat used by this species on the GWNF. Observations made since this species was discovered on the Forest indicate that this species is still present at all locations where previously found. Population size and trend studies are ongoing, as are inventories of potential habitat. As new information on population trends and habitat use surface, management activities will be adjusted to protect the eastern tiger salamander where they occur on the Forest. Forest Service management activities are having no effect on the eastern tiger salamander since all sinkhole ponds in the Maple Flats area are avoided and buffered from management activities." In 2005/2006 eastern tiger salamander egg masses and adults were found at 5 sinkhole ponds outside, and 4-5 miles west, of the Maple Flats Sinkhole Complex.

3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

Why? The potential SBAs that have been identified may be important components of biodiversity protection on the Forest.

Regarding the potential RNAs identified in the 1993 Plan: after considering the benefits versus drawbacks of RNA status it is felt that these areas are better suited as SBAs so that management can remain flexible to respond to various threats such as insects and disease, invasive species, illegal ATV use, etc.

The wood turtle is listed as a Virginia State Threatened species. A strategy for habitat management is currently being developed cooperatively by the Forest Service, Virginia Department of Game and Inland Fisheries, and West Virginia Department of Natural Resources. The strategy will be used to provide information for the planning process.

b. Tentative Options or Proposed Actions for Change

The Revised Plan would continue to recognize areas of the Forest that possess unique biological characteristics. However, other special area direction may take precedence over management of these areas. For example, if a special biological area is located within a Congressionally-designated wilderness, on maps, the special area may not always be clearly identified. Nevertheless, its special characteristics will be protected and activities designed to restore, sustain, and/or enhance their characteristics.

C-1. Modify the Forest Plan by:

- a) Allocating 57 SBAs and changing the boundaries of 21 existing SBAs for a total of 23,000 additional acres of SBAs, with acknowledgement that some or most of these may be in already protected areas such as Wilderness, Mt. Pleasant National Scenic Area or other unique areas of the Forest such as the existing Cow Knob Salamander Conservation area.
- b) Removing Big Levels, Laurel Run, Maple Flats, Shale Barren Complex, Skidmore, and Slabcamp/Bearwallow from further consideration as Research Natural Areas.
- c) Creating new SBA(s) to protect the newly found eastern tiger salamander populations.

Proposed Expansion of Existing SBAs

Existing Botanical - Zoological Area (SBA)	2010 Acres	1993 SBA Acres	Proposed Expansion Acres
BIG LEVELS Incl LOVES RUN PONDS & MAPLE FLATS	17,751	13,292	4,459
BRANDYWINE/SUGAR RUN SHALE BARRENS	163	44	119
LAUREL FORK	6,694	6,172	522
PINES CHAPEL PONDS	323	204	119
BRATTONS RUN SHALE BARREN	222	119	103
GAUGING STATION BARREN	225	46	179
BROWNS HOLLOW	1,148	1,089	59
ROUGH MOUNTAIN	2,950	2,192	758
SHENANDOAH MOUNTAIN	54,323	53,218	1,105
ELLIOTT KNOB	3,139	1,024	2,115
SISTER KNOBS	1,554	1,280	274
BALD KNOB	146	93	53
HOUSE HOLLOW	1,162	977	185
VANCE'S COVE	6	91	-85
STATONS CREEK	0	55	-55
VARIOUS SMALL AREAS	168	0	168
Totals	89,974	79,896	10,078

Proposed New SBAs

Ranger District	Proposed New Botanical - Zoological Area Name	2010 Acres
James River	Anthony Knobs	31
	Bennetts Run	2,145
	Blue Suck Barren	23
	Cast Steel Pond	540
	Frozen Knob Montane Wetland	51
	Harrington Roadside	24
	Johns Run East Barren	20
	Johns Run West Barren	68
	Johnsons Creek	335
	Morris Hill	291
	Ogle Creek	46
	Cove Mountain Ponds	99
	Cub Run Headwaters	170
	Indian Grave Ridge	17
	Moreland Gap Bog	45
	Overall Riverside	27
	Passage Creek	173
	Pond Run Pond	85
	Waterfall Mountain Cliffs	29
	Waterfall Mountain Seeps	71
North River	Big Cedar Shale Barren	43
	Brushy Knob	48
	Clayton Mill Pond	28
	Daddy Run Barrens	103
	Dunkle Knob	25
	Heavener Mountain Shale Barren	57
	Little Fork Shale Barren	108
	Ratcliff Hill	31
	Road Run Shale Barren	136
	Stuart Run	473
	Swamp Run Trib Shale Barren	14
	Whetmiller Knob	49
Pedlar	Cellar Mountain	280
	Cold Spring Branch	541
	Cole Mountain	135

Ranger District	Proposed New Botanical - Zoological Area Name	2010 Acres
	Humpback Mountain	366
	Mount Pleasant	95
	Mountain View Church	229
	Nicholson Run Seeps	129
	Punchbowl Mountain	16
	Rocky Mountain Glade	42
	Spy Rock	22
	The Priest	723
	Three Ridges Mountain - Flatrock	8
	Three Ridges Mountain - Hanging Rock	12
	Upper Crabtree Creek	209
	Upper St. Marys River	2,208
Warm Springs	Blowing Springs	627
	Chestnut Ridge Seep	127
	Chimney Rocks	160
	Cowardin Run	85
	Hidden Valley	1,074
	Mill Hill	56
	Mill Mountain Pond	31
	Mountain Grove	635
	Nimrod Hall Ridge	131
	Winterberry Pond	59
TOTAL		13,405

C-2. Do Nothing.

5. What are the Consequences of Not Changing?

As noted above, SBAs can be important components of biodiversity protection on the Forest. By not creating new SBAs rare species and rare natural communities may be inadvertently harmed by Forest activities. The proposed research natural areas continue to remain protected as they are special biological areas.

Proposed Action

Propose Option C1.

6. Recommendations for Plan Revision

Adopt the proposed new areas and expansions to existing Special Biological Areas. Do not identify a Special Biological Area for the wood turtle. Rather, incorporate the goals and objectives of the Wood Turtle Species Conservation Strategy into the desired conditions, standards and guidelines and strategies of the revised Plan.

Do not identify the Frozen Knob and Peters Mountain areas as Special Biological Areas. These areas were recommended by the Virginia Natural Heritage Program because they are considered to represent some of the best examples of old-age oak forests. SBA's have been identified to represent rare communities or assemblages of rare species, not just a particular successional stage of a common community. The boundaries of these two areas have been modified and the areas will be identified as unsuitable for timber production. In that way, the Forest will be able to further examine these areas in relation to other areas with old growth characteristics to determine if these two areas are better representatives of old growth oak forests.

H. Fisheries

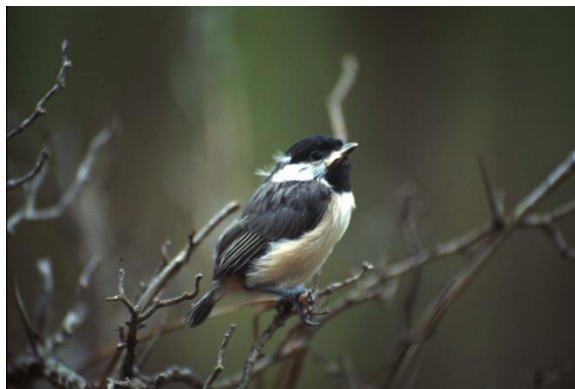
1. What was the Plan Striving For?

Fisheries were to be managed to develop and maintain aquatic habitats that contain suitable water quality, food chains, and necessary habitats for all life stages of native fish, and to facilitate sport fishing (Plan, page 2-25).

2. Where is the Plan Now?

Fishing continues to be an avid recreational pastime on the forest. See the discussion in the Riparian Area and Water Quality sections for trends in physical and chemical stream habitat.

I. Wildlife



1. What was the Plan Striving For?

The Revised Plan was to provide for a forest environment with a wide variety of habitats to meet the needs of wildlife species inhabiting the Forest, intending to focus management within four management areas (Chapter 2, pp. 2-28-29.) Management Area 14 was to emphasize providing habitat for black bear and other disturbance sensitive species. Management Area 15

was to emphasize providing habitat for wild turkey and other species that favor a more mature forest environment with small, herbaceous clearings and freedom from disturbance during nesting and brood-rearing season. Management Area 16 was to emphasize providing habitat for the ruffed grouse and other species that depend on early forest seral stages. Small game preferring open habitats, and "watchable wildlife" species were to be managed for in Management Area 22.

2. Where is the Plan Now?

Under the National Forest Management Act (NFMA) the Forest Service is charged with providing for a diversity of plant and animal communities consistent with overall multiple-use objectives. Management Indicator Species (MIS) were a planning tool used to accomplish this requirement (36 CFR 219.19 of 1982 Regulations). They were selected during forest planning "because their population changes are believed to indicate the effects of management activities" (36 CFR 219.19(a)(1)) on important elements of plant and animal diversity. They and their habitat needs are used to set management objectives and minimum management requirements and to monitor effects of Forest Plan implementation.

The George Washington Forest Plan is designed to provide habitat conditions needed to maintain viable populations of all MIS, along with other species that use similar habitats. The following describes population and habitat trends for MIS wildlife game species.

WHITE-TAILED DEER – The White-tailed Deer (*Odocoileus virginianus*) was selected because it is a species commonly hunted and its populations are of public interest (GWNF FEIS Appendix page J-12). It's a species whose habitats may be influenced by management activities such as prescribed fire, permanent opening maintenance, and timber management activities. Deer population trends are monitored by the Virginia Department of Game and Inland Fisheries (VDGIF) and West Virginia Department of Natural Resources (WVDNR).

In Virginia, deer population trends were evaluated by examining the annual rate of change in the population index (i.e., antlered buck harvest per unit area) over the 10-year period from 1996-2005. An exponential regression ($y = ae^{rt}$; where, y = population index, a = intercept, $e = 2.718$, r = instantaneous rate of change, and t = year) was used to determine trends in population. The annual rate of change (R) = $er - 1$. The status of the deer population in each county was considered to be increasing or decreasing if the annual rate of change in the population index was $>2.26\%$ (either positive or negative) and the statistical significance level of the exponential regression model was $p < 0.10$ (r^2 Value > 0.301). Annual rates of change that exceeded 2.26% represent a change of at least 25% in the population index over the decade ($1.0226^{10} = 1.25$). Counties that displayed a rate of change between 0 and $+2.26$ were deemed to be stable. Overall on the GWNF in Virginia, 9 counties, representing 660,476 acres (69% of the 956,264 total acres in Virginia) demonstrated stable population trends, and 4 counties, representing 295,788 acres (31% of total acreage in Virginia) demonstrated decreasing trends. Since 2000, VDGIF harvest data has suggested a more substantial decline across much of the GWNF.

A similar population index for GWNF public land in West Virginia counties (104,861 acres) is not available at this time. The agency's assumption is that the overall trend would be similar due to similarity of forest age structure and management activities on George Washington in the two states.

White-tailed Deer Population Index Trend across the GWNF, 1996 to 2005 (Source: VDGIF).

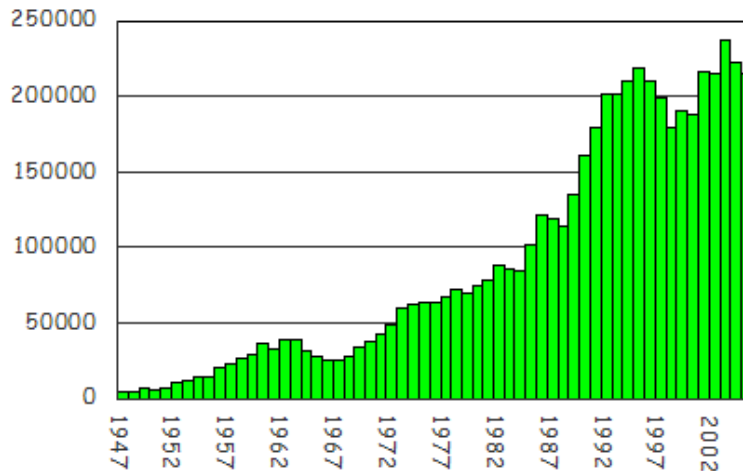
County	Percent GWNF in County	Number of GWNF Acres in County	Ranger Districts Included	R ¹	r ² Value	Status
Allegheny	56	159,359	James River, Warm Springs	-3.23%	0.180	Stable
Amherst	19	57,600	Pedlar	-6.90%	0.762	Decreasing
Augusta	30	186,239	North River, Pedlar	-1.80%	0.168	Stable
Bath	50	170,239	North River, Warm Springs	-4.70%	0.299	Stable
Botetourt	2	5870	James River,	-3.04	0.325	Decreasing
Frederick	2	5,120	Lee	-4.58	0.297	Stable
Highland	5	13,440	North River, Warm Springs	-4.80%	0.269	Stable
Nelson	6	17,920	Pedlar	-4.39%	0.254	Stable
Page	13	25,600	Lee	-0.12%	0.002	Stable
Rockbridge	17	95,999	North River, James River, Pedlar	-3.85%	0.374	Decreasing
Rockingham	25	136,319	North River, Lee,	-5.15%	0.545	Decreasing
Shenandoah	23	75,519	Lee	-1.98%	0.284	Stable
Warren	5	7,040	Lee	2.95%	0.150	Stable

¹ R = Percent annual change in population index. Values less than -2.26% and values greater than 2.26% are considered significant (1.0226¹⁰ = 1.25 or a 25% increase or decrease over the 10-year period).

² p = Statistical significance level of exponential regression model. Values (p < 0.10) are considered significant.

Statewide, VDGIF reports a 3% decrease in total number of deer harvested in 2005 compared to 2004, but the total number harvested was still 4% greater than the 10-year average.

Virginia Deer Harvest, 1947 to 2005



Source: <http://www.dgif.state.va.us/wildlife/deer/harvestsummary.asp>

In 2000, VDGIF and WVDNR estimated deer populations at 49,418 individuals on the GWNF. Based on evidence of declines in recent years, deer populations for 2005 are estimated to be lower on the GWNF than in 2000. Virginia's newly revised Deer Management Plan has an objective to stabilize deer populations on public land in counties that contain GWJNF lands ([Virginia Deer Management Plan: 2006-2015](#)). In addition, the revised Deer Management Plan recommends supporting habitat management objectives on public lands that manipulate vegetation for early successional wildlife and promote restoration, regeneration, and productivity of plant species important to wildlife, particularly those that provide diverse hard and soft mast (e.g., American chestnuts, acorns, grapes, and berries). Active timber

management since 1993 has declined from about 3,000 acres per year to about 800 acres. Conversely, prescribed burning has increased from about 1,000 acres per year to about 7,000 acres. Both of these activities, in addition to natural disturbances and continued maturation of the forest, provide patches of early successional woody habitat, as well as restoring and maintaining open oak, oak/pine, and pine woodlands. Combined with the maintenance of over 80% of forested acres in mature forest condition, the George Washington should be able to provide the mosaic of forest types and ages recommended for white-tailed deer. The white-tailed deer is a game species that is harvested throughout Virginia and West Virginia; therefore, population viability is not a concern. As a general rule, deer harvest on NFS land (as measured by Antlered Buck Harvest/Square Mile of Deer Habitat) is lower than on private ownership. Overall, however, viability is well sustained for white-tailed deer on the GWJNF. Based on the results of population monitoring and habitat evaluation, this species has the abundance and distribution across the Forest that will provide for its persistence into the foreseeable future. However, without increased management to enhance deer forage on GWNF, it is unlikely that deer populations can be sustained at levels to meet public demands for viewing and hunting without increasing deer damage to plant communities (VDGIF 2007). Without management to increase understory vegetation, even low deer populations can damage plant communities and suppress tree regeneration.

However, caution is warranted as deer populations may be decreasing in certain parts of the national forest in certain counties such as Rockingham, based on hunter contacts and biologists noticing a lack of deer "sign" in the woods (VDGIF 2007).

BLACK BEAR – The Black Bear (*Ursus americanus*) was selected because it is a species commonly hunted and its populations are of public interest (GWNF FEIS Appendix page J-12). It's a species whose habitats may be influenced by management activities. Black Bear are an opportunistic species, thriving in a variety of habitat types. Important habitat elements are habitat continuity, habitat diversity, den site availability, and availability of hard mast (GWNF FEIS, Appendix page J-12). The state agencies of Virginia and West Virginia use a combination of indices derived from harvest, nuisance activity, age structure, and miscellaneous mortalities to monitor status of black bear population. VDGIF uses the Downing method to perform black bear population reconstruction and determine population trends (D. Martin, VDGIF Black Bear Biologist, Pers. Communication, 5/21/2004). Five years of harvest data is required to reconstruct one year of population estimates, as such the reconstructed population data is for the years 1989-1998. Both male and female populations exhibited an increasing trend.

Virginia's Black Bear Population Trend, 1989 to 1998
Downing Method

<u>Sex</u>	<u>Population Growth Trend (%) per year</u>	<u>R-Square</u>	<u>Significance</u>
Male	+ 7.4	0.97	P<0.97
Female	+ 4.2	0.91	P<0.91

In addition, the trend in annual bear hunter harvests reflects the trend in population growth; this can be verified by comparisons of past harvest trends to trends in population reconstruction analyses. During the last 10 years (1995-2005), Virginia's bear harvest has been significantly increasing at an average annual rate of 7.8% per year (95% confidence interval is 4.0% - 11.8%)(D. Steffen, VDGIF Forest Wildlife Program Manager, Pers. Communication, 11/2006).

Based on the current age-class structure of forested land in the GWNF's, 88% of all forest types are mature (71-150+ years). Increased acres of older hardwood stands, sustained hard mast production, and enhanced soft mast production through forest management activities—such as prescribed fire and timber harvest—have contributed to improved black bear habitat on the Forest (VDGIF 2002). The black bear is a game species that is harvested throughout Virginia and West Virginia; therefore, viability is not a concern. Overall, viability is well sustained for black bear on the GWNF. Based on the results of

population monitoring and habitat evaluation, this species has the abundance and distribution across the Forests that will provide for its persistence into the foreseeable future (VDGIF 2002).

WILD TURKEY – The Wild Turkey (*Meleagris gallopavo*) was selected because it is a species commonly hunted and its population is of public interest. It is a species whose habitats may be influenced by management activities (GWNF FEIS Appendix page J-12, JNF Revised Plan FEIS, page 3-138). Wild Turkeys prefer mature forests with open understories and well-dispersed patches of early successional woody and grass/shrub vegetation. Wild turkey population trends are monitored by the Virginia Department of Game and Inland Fisheries (VDGIF) and West Virginia Department of Natural Resources (WVDNR). Population trends, in terms of harvest/square mile, vary over the years, but indicate an overall stable to increasing population trend.

Spring Wild Turkey Harvest Information on GWNF, 1997 To 2006 (Source: <http://www.dgif.state.va.us/wildlife/turkey/nationalforestspringturkeyharvest2006.pdf>)

County	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Harvest /square mile
Allegheny	102	45	87	74	148	117	112	83	88	88	0.34
Amherst	34	26	30	30	37	43	51	32	40	35	0.39
Augusta	158	93	95	139	158	157	122	86	56	114	0.37
Bath	134	91	153	133	221	164	106	99	66	119	0.44
Botetourt	99	45	41	52	93	84	91	65	58	66	0.54
Frederick	4	6	4		3	3	6	5	6	8	1.04
Highland	26	26	41	47	61	38	32	17	22	36	0.40
Nelson	6	3	6	4	2	12	3	3	2	6	0.20
Page	10	6	6	7	13	5	8	6	9	20	0.47
Rockbridge	43	31	26	24	45	63	35	38	41	50	0.48
Rockingham	125	63	68	57	91	93	92	76	53	92	0.42
Shenandoah	57	41	31	20	48	48	47	60	44	70	0.59
Warren	3	4	3	3	9	5	9	6	3	3	0.31

Wild turkeys use a wide range of habitats, with diversified habitats providing optimum conditions. Timber management since 1993 has declined from about 3,000 acres per year to about 800 acres. Conversely, prescribed fire has increased from about 1,000 acres per year to about 7,000 acres. Timber management and some prescribed fire, in addition to natural disturbances and continued maturation of the forest, provide patches of early successional woody habitat, as well as restoring and maintaining open oak, oak/pine, and pine woodlands. Combined with the maintenance of over 80% of forested acres in mature forest condition, the George Washington should be able to provide the mosaic of forest types and ages recommended for wild turkey. The wild turkey is a game species that is harvested throughout Virginia and West Virginia; therefore, population viability is not a concern. Overall, however, viability is well sustained for wild turkey on the GWJNF. Based on the results of population monitoring and habitat evaluation, this species has the abundance and distribution across the Forest that will provide for its persistence into the foreseeable future.

See also section on vegetation management and prescribed fire for a further discussion on habitat management trends by management area.

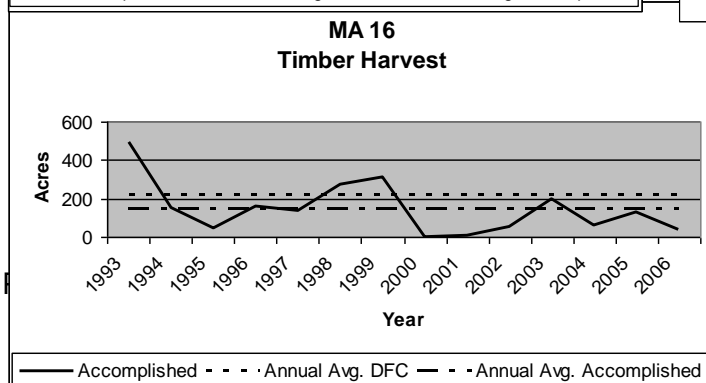
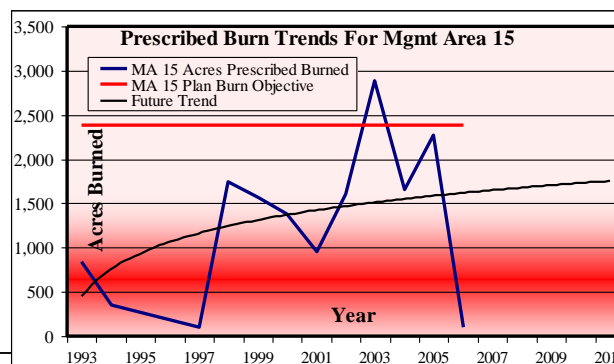
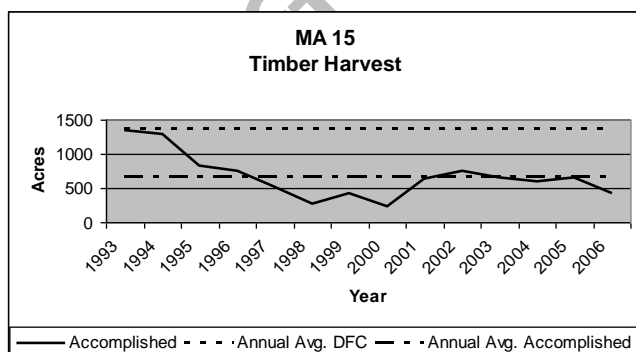
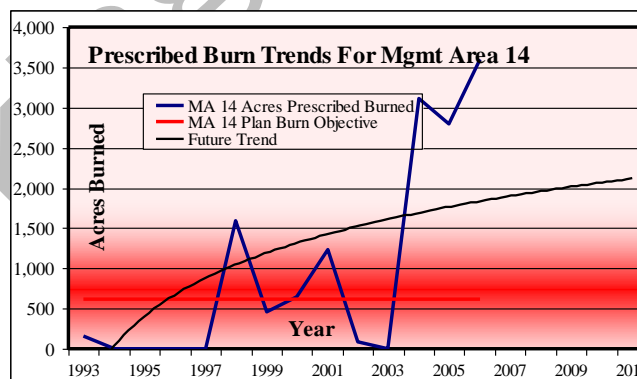
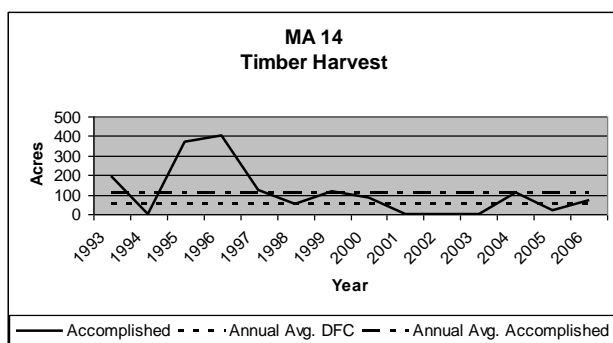
Management Areas 14, 15, and 16 contains 267,000 acres of land suitable for timber production (76% of 350,000 total acres suitable for timber production). Management area 22 has 6,000 acres that are managed intensively for a variety of wildlife species, with each area focusing on a theme such as wildlife viewing, environmental education, small game management, or combinations thereof. These areas are generally small in acreage, have easy

access, and were often at one time farm land. A high proportion of MA 22 is open land that is classified as unsuitable for timber production.

Management Areas 14, 15, and 16 were designed for wildlife management as its major focus and have specific habitat management objectives to meet desired habitat needs for various wildlife species. Other management areas, while benefiting wildlife species, were not designed with wildlife management as their main focus. MAs 14, 15, and 16 have the following desired annual amount of vegetation manipulation (Monitoring and Evaluation reports 1994-2004):

Management Area	Management Area Acres	Average Annual Timber Harvest Objective (Acres)	Percentage of Timber Harvest Acres by Decade	Average Annual Prescribed fire Objective (Acres)	Percentage of Prescribed fire Acres by Decade
14	133,000	52	0.39 %	614	5 %
15	331,000	1,361	4 %	2,386	7 %
16	39,000	217	5.5 %	0	0

The following graphs show accomplished timber harvest and prescribed fire trends by Management Area from 1993 to 2006.



While timber harvest levels were variable from year to year, total percentage of 0-10 early successional habitat by two 10-year periods, 1993-2003 and 1996-2006 are shown below. Desired percentages of 0-10 early successional habitat were met by Management Areas 14 and 16 in the first 10-year period and only by Management Area 14 in the second 10-year period. Desired percentages of 0-10 early successional habitat were not met in Management Area 15 for either 10-year period. Desired percentages of prescribed fire acres were not met in Management areas 14 or 15 in the first 10-year period, but were exceeded in MA 14 in the second 10-year period.

Categories (1993 to 2006)	Management Area		
	14	15	16
Total Timber Harvest Acres	1,332	7,705	1,840
% Timber Harvest Acres by Decade	1%	2%	5%
Total Timber Harvest Acres	978	4,843	1,376
% Timber Harvest Acres by Decade	0.74%	1.50%	3.50%
Total Prescribed fire Acres	4,182	11,435	N/A
% Prescribed fire Acres by Decade	3%	3.50%	N/A
Total Prescribed fire Acres	13,534	14,263	N/A
% Prescribed fire Acres by Decade	10%	4%	N/A

Forest-wide on the GWNF, over 80% of forested acres is in a mature condition (71-150+ years). As described in the section on interior forest fragmentation and MIS such as black bear, pileated woodpecker, ovenbird and worm-eating warbler, the GWNF has provided large blocks of relatively unfragmented, mature forested habitat and has benefited those species that depend on such habitat. Timber and some fire management, in addition to natural disturbances and continued maturation of the forest, provide patches of early successional woody habitat, as well as restoring and maintaining open oak, oak/pine, and pine woodlands, but has not met specified early successional habitat objectives for management areas 14, 15, and 16. As described in the section on early successional forest fragmentation and MIS such as northern flickers, yellow pine, and white-tailed deer, early successional habitat and open woodland habitat has declined across the GWNF. Open woodland restoration has been identified as a need for change in other sections (see fragmentation, MIS, Endangered species, and fire sections).

As seen in this photo from the North River RD, open woodland habitat retains mature trees and is classified as mature in the overall age-class structure tables, yet provides an understory of native grasses and shrubs that can be maintained as a stable component of this forest type (Grossman 1998).

Historically created and maintained with disturbance regimes such as fire, open oak woodland restoration, using active management tools such as prescribed fire and timber treatments, can provide habitat required by many species at some point in their yearly life cycle needs, including white-tailed deer, ruffed grouse, black bear, wild turkeys, Indiana bats, golden-winged warblers, and many 'forest interior' bird species during critical post-breeding, migratory, and wintering life cycles.

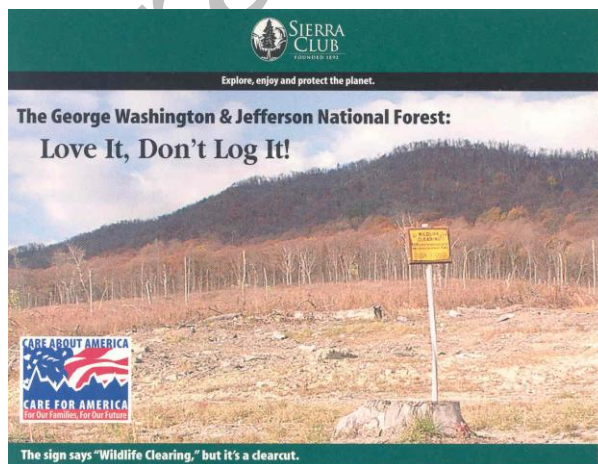
In addition, early successional habitat patches created by timber harvests can be used to restore blight resistant American chestnut. Once invaluable as a steady source of hard mast to

many wildlife species, programs such as Virginia Tech's American Chestnut Cooperative are now providing all native chestnut seedlings that show enhanced resistance to the chestnut blight. A chestnut restoration program on the GWNF is now in the planning stages and will need patches of early successional habitat to allow planted seedlings to compete effectively in a mostly forested environment (American Chestnut Cooperators Foundation).



Evick Knob, North River RD, GWNF

This picture of a Sierra Club postcard was of Unit 8 of Panhandle 814 Salvage, a 40 acre salvage treatment completed in September 2000. Per the 1993 Forest Plan, the area is being managed for maintaining or enhancing quality habitat for wild turkey and other species that favor a more mature forested landscape interspersed with small, herbaceous openings (both temporary and permanent) (Forest Plan, pages 2-29 and 3-79). In addition, research is finding that early successional habitats are also important to many 'forest interior' bird species, during the critical time period just after breeding and during migration. These areas provide 'safe havens' for adult and fledgling birds for the following needs: molting, abundant food for the buildup of fat reserves for migration, and protection from predators. Early successional habitat also provides needed breeding habitat for high priority bird species such as prairie warblers and yellow-breasted chats, both of are both present on this site (based on annual monitoring records). These studies strongly recommend conservation strategies that maintain large tracts of mature forest, within which there is a mosaic of different forest types and ages (early and



mid-successional forest stands), to provide the habitat requirements needed by migratory birds during all of their life stages here in North America (for more information, please see George Washington and Jefferson Detailed Monitoring and Evaluation Report for Fiscal Year 2004, Appendix G: Population Trends of Management Indicator Species)(http://www.fs.fed.us/r8/gwj/projects_plans/index.shtml).

Time changes how vegetation and active management look. On June, 2006, this is how the same harvested area looked. The 1993 Plan's desired condition is being met today by what appears on the land.



3. Did Management Activities Move the Forest towards the Desired Future condition?

Management activities did move the forest towards the desired future condition described across Management Areas, but did not meet specific objectives in several Management Areas.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? The George Washington and Jefferson National Forests were administratively combined in 1995. The Jefferson Plan was most recently revised (2004). The extent the two plans can be aligned in format and direction would maximize efficiency in administration and management.

c. Tentative Options or Proposed Actions for Change

C-1. Modify the Forest Plan, as appropriate by:

- a) Adopting Jefferson Revised Plan Goals 1, 2, 6, 8, 12, 13, 14, 15, and 18.
- b) Adopting and modifying Jefferson Revised Plan Objectives 8.01, 12.02, 12.03, 12.04, 12.05, 13.01, 18.01, 18.02, and 18.03.
- c) Adopting Jefferson Revised Plan Forestwide standards FW-32, FW-33, and FW-77.
- d) Adopting as desired conditions, objectives, and standards and guidelines the Jefferson Revised Plan Management Prescriptions 8A1, 8B, 8C, 8E1, 8E6, and 10B.
- e) Increasing the prescribed burn objective.

- f) Adding an objective for open woodland restoration, specifically for wildlife purposes.
 - g) Adding an objective for blight resistant American chestnut restoration.
- C-2. Merge GW Management Areas 14, 15, 16, 17, and 22 (Jefferson Prescriptions 8A1, 8B, 8C, 8E1, 8E6, and 10B) into one area and modify the Plan under C-1 options above, as appropriate given the merging.
- C-3. Do nothing.

5. What are the Consequences of Not Changing?

Open woodlands were historically present across the GWNF and have declined dramatically since the turn of the previous century, mainly due to fire suppression. Characterized by an open mature tree canopy and a stable understory of native grasses, forbs and shrubs, open woodlands provide habitat needs for an increasing number of species that are declining in population or are already rare across the GWNF. By not emphasizing open woodland restoration, the plan would not be able to provide an important habitat component for these species. American chestnuts were once an important component of the forested landscape on the GWNF and invaluable to many wildlife species as a stable source of food and shelter. With more blight resistant, all native seedlings now available, to not have an American chestnut restoration program on the GWNF would miss an important opportunity to start re-introducing an important species for wildlife.

Proposed Action

Propose Option C2.

6. Recommendations for Plan Revision

See the discussion under Habitat Fragmentation. Incorporate the intent of the identified goals, objectives and standards and guidelines from the Jefferson Revised Plan into the desired conditions, objectives and standards and guidelines of the revised Plan. Desired conditions and standards and guidelines for the current GW Management Areas 14, 15, 16, and 17 will be incorporated into one set of desired conditions and standards and guidelines.

Issue Resource Sustainability

A. Ecosystem Management/Ecological Restoration

1. What was the Plan Striving For?

The 1993 Revised Plan was to provide a variety of resource benefits, including wood, wildlife, fish, range, dispersed recreation, developed recreation, minerals, wilderness and special uses, in a manner that maintained the diversity, productivity and long-term sustainability of ecosystems. Lands and resources were to be managed for a number purposes such as producing, restoring, or sustaining certain ecological conditions; for desired resource uses and products; and for aesthetic, heritage, or spiritual values. These goods and services were to be produced in an environmentally acceptable manner (1993 Forest Plan at page 2-30.)

2. Where is the Plan Now?

The principles of ecosystem management were incorporated into the 1993 Forest Plan and were implemented. An aspect of ecosystem management that needs to be highlighted is restoration.

As part of implementing the USDA Forest Service Strategic Framework's Goal 1 to "Restore, sustain and enhance the Nation's forests and grasslands", restoration is one of the three focus areas under the Region 8 Strategic Framework and has three major objectives:

1. Condition of watersheds is improved. Aquatic organism passage is improved in forest priority watersheds. Watershed condition class is improved in regional priority sub-watersheds.
2. Native vegetation identified in Forest or state plans is restored. Nonnative invasive species are controlled.
3. Rare species are restored. Mid- to high-elevation early-successional habitat acres are increased. Habitats or populations of rare species are stable or improving.

Ecological restoration is defined in Forest Service Manual 2000, Chapter 2020 as *"The process of assisting the recovery of resilience and adaptive capacity of ecosystems that have been degraded, damaged, or destroyed. Restoration focuses on establishing the composition, structure, pattern, and ecological processes necessary to make terrestrial and aquatic ecosystems sustainable, resilient, and healthy under current and future conditions."*

3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? The Plan should reflect national and regional strategies for implementing the Forest Service's mission.

The Forest Plan does not discuss restoration of the American Chestnut. The chestnut was a dominant tree in many parts of the Forest ecosystem. Recent advances have resulted in blight-resistant planting stock that should be available for planting in the near future.

Beavers are unique in their ability to create and modify their habitat by building dams. Because they exert such a strong influence on aquatic and riparian communities, the beaver is considered a keystone species (Boyle and Owens, 2007). As such, it is important to highlight beaver populations in restoration goals for the Forest.

c. Tentative Options or Proposed Actions for Change

C-1. Add a new Desired Condition that states: "A blight-resistant American chestnut (*Castanea dentata*) returns to the Forest as a dominant species."

Add plan components addressing the following:

1. Improving the quality of unhealthy stream systems within unhealthy watersheds.
2. Maintenance or enhancement of native ecosystems.

3. Restoration of fire-dependent ecosystems.
4. Restoration of structural and species diversity in forest stands.
5. Controlling nonnative invasive species.
6. Aquatic organism passage.
7. Maintenance or enhancement beaver populations on the Forest.

5. Recommendations for Plan Revision

Use Option C1.

B. Extirpated Animal Species

1. What was the Plan Striving For?

The 1993 Revised Plan did not promote the reintroduction of extirpated animal species. The lead agency on such an action is either the USDI Fish & Wildlife Service or an appropriate agency of Virginia or West Virginia. The Forest Service serves as a coordinating agency when any decision is made to reintroduce an extirpated species (1993 Forest Plan at page 2-31.)

2. Where is the Plan Now?

No extirpated species were reintroduced by USDI Fish & Wildlife Service, any West Virginia State Agency, or any Virginia State. An administrative correction will be done and the discussion will be removed from the plan since the agency has no control over reintroductions. The agency will continue to work with the respective agencies if and when reintroduction of a species is analyzed.

3. Did Management Activities Move the Forest towards the Desired Future condition?

Not Applicable

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? No

b. Why? The reintroduction of extirpated species is not within the statutory authority of the U.S. Forest Service. This issue will not be carried forward.

C. Soil Productivity

1. What was the Plan Striving For?

The Revised Plan contains standards which ensure that management practices are implemented in a manner that maintains or improves the long term productivity of the site. In actively eroding areas where the resources are incurring unacceptable damage as a result of human activities or natural processes, restoration projects are implemented. In any project, soil productivity is protected through the application of mitigation measures as specified in Common Standards. Representative samples of projects are monitored to ensure that soil productivity is maintained.

Watershed improvement projects were to be implemented in actively eroding areas where sediment was affecting a stream's beneficial uses (Plan page 2-31.)

2. Where is the Plan Now?

From FY1993 to FY2008 a variety of soil-disturbing activities were monitored for implementation of Best Management Practices. Most were timber sales, including salvage sales, but prescribed burns, wildfires, wildlife clearing development, road construction and maintenance, waterhole rehabilitation, dam construction, trail construction, and pasture fencing also were monitored.

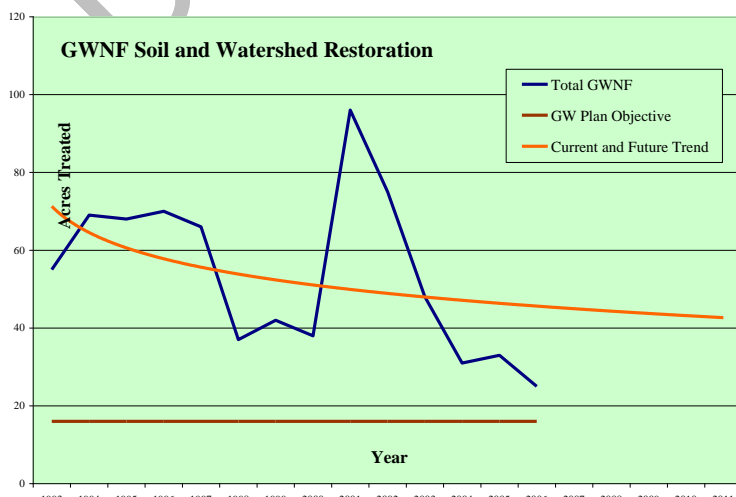
Of 2,460 BMP monitoring elements, 96.5 percent showed that implementation met or exceeded BMP requirements, 3.4 percent showed only minor departures from the intent of the BMP, and 0.2 percent showed major departures from the intent of the BMP. The instances of "departures from the intent of the BMP" show no particular pattern of a particular BMP violation.

The Virginia Department of Forestry conducted water quality monitoring in association with timber harvests from 1989 to 1996 (Virginia Department of Forestry 1998 Conclusions suggested by water quality monitoring near private timber harvests: 1989-1996, an executive summary) At sites in the mountains, Piedmont, and coastal plain, water temperatures were taken at 10-minute intervals, and water samples were collected automatically before, during, and after storm events, both upstream and downstream from logging. Aquatic macroinvertebrates were also sampled periodically. This monitoring showed that, when forestry BMP's are properly implemented, timber harvests can be accomplished without a large or persistent increase in sediment, an increase in stream water temperatures, or a shift in macroinvertebrate species composition. Since the Forests' monitoring indicates that forestry BMP's were properly implemented, it can be concluded that these practices were effective in protecting water quality.

Environmental assessments have estimated soil movement and forested T-factors for timber harvest areas, log landings, and skid trails. We have not done an environmental analysis on the Forest where soil erosion was expected to exceed the forested T-factor for the site. This factor has been used as a way to estimate soil movement on slopes during and after resource management activities on the Forest. The T-factor, which was developed by the Forest Service, is an adaptation of the Universal Soil Loss Equation, which is used on agricultural lands. The T-factor itself is a modeling tool used as a threshold amount of soil which can be "lost" and not reduce long term productivity. Currently we do not typically monitor this factor on projects because it is very variable across project areas and it has not appeared as a problem during the environmental analyses across the Forest. For T-factor analyses completed from FY 2001 through end of FY 2003, the predicted maximum one-year soil loss averaged only 11% of the allowed maximum one-year soil loss, and ranged from 3% to 27%.

Common Standard for the GW Forest #216 (page 3-146) says project environmental analyses for timber harvesting will consider impacts to long term soil productivity. One of the situations listed where long term soil productivity may be impaired is where the soil's erodibility and slope

combine to indicate the estimated T-factor to be exceeded.



The trend in watershed improvement activities is shown in the graph. The Plan's objective of 16 acres per year was met. Some backlog remains, mostly the

result of natural events such as flooding, illegal vehicle and trail use and past mining efforts.

3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes, soil and water improvement work and project environmental analysis have improved or maintained soil productivity on the Forest.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? It is recommended that we not use T-factor estimates in environmental analyses in the GWNF Plan Revision as stated in Common Standard 216, page 3-146 of the current GW Plan. Instead, we will use Region 8 Soil Quality Standards, now in place, as a threshold for protecting soil productivity. The R8 Soil Quality Standard related to maintaining 85% of the project activity area's topsoil and organic layer is a more realistic estimate of the impact of a project on soil productivity and is already contained in the current GW Forest Plan Common Standard 211, page 3-145. This is also a Common Standard for the JNF Forest #5 (page 2-7). We will also include using estimated operating/logging plans to allow for more site specific environmental analysis estimates for displaying the effects to soil productivity from management activities. By using project specific plan estimates for log landings, roads, skid trails and stream crossings we can better estimate impacts to water quality and soil productivity.

Common Standard 215 in the current GWNF Forest Plan, page 3-146, does not allow whole tree harvesting on the Forest. We have learned from research that it is important to protect soils with low buffering capacity to acid deposition from whole tree harvesting due to excessive nutrient removal. We have identified the most susceptible areas on the Forest for low nutrients and acid sensitivity. We will continue to protect soil productivity by not whole tree harvesting in these areas.

There is much evidence now of acidic deposition that has occurred in and near the George Washington National Forest for decades. The Clean Air Act has reduced some components of the deposition in recent years. There is a lag time before these improvements begin to show up in the soils and water affected by this deposition. Some of the geology and soils of the Forest have low buffering capacity against the effects of acid deposition. These areas can be generally mapped using geology, water chemistry, soils and atmospheric deposition spatial and tabular data. These low buffered areas have the greatest risk of becoming increasingly acidic, having greater amounts of aluminum in rooting zones and having stressed ecosystems due to losses of beneficial plant available soil nutrients.

These high risk areas for soil acidification are also areas where whole tree harvesting can have the most impact on soil productivity. Whole tree and biomass removal harvests could be more in demand as bio fuels and other products that require harvesting all biomass growing on a site. This could become a desired use for some of the lower quality sites on the Forest, where total

biomass removal could be more viable than a bole only product. Removal of large amounts of nutrients on these poorer sites through whole tree harvesting (biomass removal) can affect soil productivity according to some research. Soils most susceptible to impacts from whole tree harvesting are characterized by shallow depth to bedrock, low clay content, drier aspects and thin organic layers on the surface. Most likely, low site index (SI) as well.

Whole tree harvesting on more productive sites with more buffering capacity seems to be a lower risk for impacting soil productivity. To protect soil productivity on our higher risk soils, there seems to be good support in literature to not do whole tree (biomass) removal on our poorer sites (Site Index ≤ 50). Other silvicultural treatments and firewood removal would be acceptable. Whole tree harvest could be allowed on areas suitable areas SI >50 . Conserving nutrients on our poorer sites seems to be a good thing to do according to research, especially with acid deposition continuing its effect on the less buffered soils and watersheds.

Evidence of Acid Deposition Impacts:

Driscoll, Charles T., et al., 2001.

- Acidic deposition has accelerated the leaching of base cations from soils, thus delaying the recovery of ANC in lakes and streams from decreased emissions of SO₂ (at the Hubbard Brook Experimental Forest the available soil Ca pool appears to have declined 50% over the past 50 years).
- Sulfur and N from atmospheric deposition have accumulated in forest soils across the region, and the slow release of these stored elements from soil has delayed the recovery of lakes and streams after emissions have been reduced.
- Acidic deposition has increased the concentration of toxic forms of Al in soil waters, lakes, and streams deficiencies of Ca²⁺ and Mg²⁺ have caused extensive mortality of sugar maple in Pennsylvania, and acidic deposition contributed to the depletion of these cations from soil.

Lovett, G.M., and T.H. Tear. 2008

- Nitrogen contributes to acidic deposition, ground-level ozone, and over-enrichment of soil and surface water. Reduces forest productivity (under high loading). Increases potential vulnerability to pests and pathogens. Causes declines in some sensitive wetland plant populations. Alters plant species composition. Increases algal growth and reduces water clarity in some systems. Contributes to declines in dissolved oxygen and degradation of nursery habitats in estuaries.
- Enhances the mobilization of toxic aluminum from soils to tree roots.
- Increases sulfate and nitrate leaching from soils to surface waters.
- Promotes the loss of important buffering nutrients from soils.
- Reduces ecosystem productivity.

S. W. Bailey,* S. B. Horsley, and R. P. Long, 2005

- At all four sites there were significant decreases in exchangeable. Ca and Mg concentrations and pH at all depths. Exchangeable concentrations increased at all

depths at all sites, however increases were only significant in upper soil horizons. There were long-term decreases in pH, exchangeable Ca, and exchangeable Mg concentrations and increases in exchangeable Al concentration at all depths between two sampling periods separated by 30 yr.

- Acidic deposition endangers forest health by depleting available calcium in the soil system. Between 1967 and 1997 acidic deposition caused significant decreases in exchangeable soil calcium at all of four study sites on the Allegheny Plateau in Pennsylvania.

Cronan and Schofield, 1979;

- These observations indicate that calcium may become a limiting resource for the growth of forested ecosystems, ultimately predisposing forests to health problems such as increased mortality due to reduced resistance to pests and pathogens

Federer et al., 1989,

- Along with base cation leaching, another consequence of soil acidification is increased solubility and mobility of aluminum in forested ecosystems

Whole Tree Harvesting Effects upon Soil.

Katherine J. Elliott, Jennifer D. Knoepp, 2005.

- Methods that remove excessive amounts of organic material (branches, leaves, tree 17 crowns), such as whole-tree harvesting, have more detrimental effects on nutrient availability than stem-only removal methods that leave more organic material at the harvest site.

United States Department of Agriculture Forest Service Pacific Northwest Research Station
General Technical Report, PNW-GTR-222, March 1989.

- In conventional harvesting, where only the bole or stemwood is removed, nutrient losses tend to be low.
- Stemwood and bark of most temperate forest trees account for about 65 to 85 percent of the total biomass but only 25 to 50 percent of the total nitrogen in the trees (Marion 1979).
- Natural inputs of nutrients will often compensate for losses of this magnitude, resulting in no loss of long-term productivity potential.
- On nutrient poor sites having a high percentage of total nutrients stored in the trees, productivity potentials could be lowered.
- Whole-tree harvests can increase average nitrogen-removal rates in some temperate coniferous forests by 100 percent and in some temperate broadleaf forests by as much as 215 percent (Marion 1979). The actual increase in nutrient losses brought on by whole-tree harvesting varies greatly with species, age, and site productivity, but harvest methods removing more than just the stem result in substantially greater nutrient losses (Morrison and Foster 1979).

- The absolute amounts removed are less important than the time required for the site to replace the lost nutrients.
- If revegetation of the site is rapid, the accelerated leaching losses usually last for only a few years. Even with immediate revegetation of the site, however, a lag of at least one year occurs in which more nutrients are mobilized than can be taken up by the vegetation (Bormann and Likens 1979). The nutrients released through decomposition of the forest floor and increased nitrification can enhance the growth of regeneration on the site.

Other whole tree harvest research:

1. Due to low soil Ca content and high Ca content in woody tissues, whole-tree harvesting depleted total ecosystem Ca to a much greater extent than N, P, or K. Soil reserves and atmospheric inputs may be adequate to sustain total N, P, and K supplies with whole-tree harvesting, but soil amendments may be necessary to sustain Ca supplies.
2. Regardless of the intensity of forest harvest, the quantity of nutrients lost from the site by soil erosion or rainwater leaching was small compared to amounts removed in harvested wood. Nutrients removed in harvested wood were potentially large enough to reduce subsequent forest growth at some sites.
3. The combination of leaching loss and whole-tree harvest at short (40-year) rotations apparently could remove roughly 50% of biomass and soil Ca in only 120 years.
4. Calcium and Mg concentrations at the clearcut site were 88 and 75% higher than the levels at the whole-tree site 5 years after harvest. The increased soil fertility observed could provide a valuable nutrient supply to the succeeding forest stand, but net nutrient outputs through harvest and burning could also eventually reduce the already low productivity of these sites.
5. Full tree harvesting removes substantially more nutrients from the site than tree length harvest methods due to the high concentration of nutrients in the branches and foliage (Maliondo et al. 1990). The possible effects of this nutrient removal include a decline in soil fertility (Wells and Jorgensen 1979, Perala and Alban 1982, Silkworth and Grigal 1982), loss of organic matter and a potential increase in site acidification (Maliondo et al. 1990).
6. The decomposition of logging slash is an important source of N for the next tree crop, especially on nutrient poor sites. With full tree harvesting there is often very little remaining debris (Gordon 1983), and this may lead to a N deficiency.
7. Theoretically, site acidification is thought to result from the removal of positive ions or cations (K, Ca, Mg and sodium (Na)) normally present in the branches and foliage of trees (Foster and Morrison 1987, Maliondo 1988). These cations normally buffer acid inputs from precipitation and from the decomposition of organic matter (Maliondo 1988).
8. Organic matter decomposition releases organic and inorganic acids as well as cations and may be accelerated after full tree harvesting due to increased soil temperature and moisture availability (Maliondo 1988).

Review of the combined issues in research.

- These observations indicate that calcium may become a limiting resource for the growth of forested ecosystems, ultimately predisposing forests to health problems such as increased mortality due to reduced resistance to pests and pathogens (Federer et al., 1989; Huntington et al., 2000; Adams, 1999)
- Whole-tree harvests can increase average nitrogen-removal rates in some temperate coniferous forests by 100 percent and in some temperate broadleaf forests by as much as 215 percent (Marion 1979). The actual increase in nutrient losses brought on by whole-tree harvesting varies greatly with species, age, and site productivity, but harvest methods removing more than just the stem result in substantially greater nutrient losses (Morrison and Foster 1979).
- Due to low soil Ca content and high Ca content in woody tissues, whole-tree harvesting depleted total ecosystem Ca to a much greater extent than N, P, or K. Soil reserves and atmospheric inputs may be adequate to sustain total N, P, and K supplies with whole-tree harvesting, but soil amendments may be necessary to sustain Ca supplies.
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- Theoretically, site acidification is thought to result from the removal of positive ions or cations (K, Ca, Mg and sodium (Na)) normally present in the branches and foliage of trees (Foster and Morrison 1987, Maliondo 1988). These cations normally buffer acid inputs from precipitation and from the decomposition of organic matter (Maliondo 1988).

Indicators of risk:

- The calcium/aluminum (Ca/Al) molar ratio of the soil solution provides a valuable measurement endpoint or ecological indicator for identification of approximate thresholds beyond which the risk of forest damage from Al stress and nutrient imbalances increases. The Ca/Al ratio can also be used as an indicator to assess forest ecosystem changes over time in response to acidic deposition, forest harvesting, or other processes contributing to acid soil infertility.
- Based on a critical review of literature on Al stress, we estimate that there is a 50:50 risk of adverse impacts on tree growth or nutrition when the soil solution Ca/Al ratio is as low as 1.0, a 75% risk when the soil solution ratio is as low as 0.5, and nearly a 100% risk when the soil solution Ca/Al molar ratio is as low as 0.2.
- The Ca:Al ratio of soils can be used to guide the location of soil disturbing activities and determine harvest method and rotation length.
- According to White and Harvey (1979), timber harvesting should be avoided on sites with very shallow to bedrock soils and marginal fertility. A significant proportion of the

nutrients are contained in the above ground biomass and the limited productivity of the site is maintained by the nutrient cycle.

- Sites sensitive to nutrient depletion as a result of full tree harvesting include those with medium to coarse textured soils and little humus, and sites with shallow soils.
- Bailey et al. 2004, 2005 propose that calcium levels below 2% in the B horizon is a threshold below which forest health will become susceptible to decline.
- Because of these biological responses to changes in the soil system, aluminum contents in biomass can be used to classify the health of forested ecosystems (Cronan and Grigal, 1995; Johnson et al., 1982)
- Forests on deeper soils are generally less susceptible to nutrient depletion from full tree harvesting than stands on shallow soils (Timmer et al. 1983). This is, in part, related to the absolute soil volume differences between the two soil depths and the associated differences in aeration, water retention and movement. On poor quality sites, in which a large proportion of the nutrient capital of the site is contained in the crown components, full tree harvesting may be more detrimental to long-term productivity.

Proposed management strategy and mitigations for the National Forest.

- Soil pH increased after fire and thinning+fire
- Timber harvesting practices may be modified in areas with low pH and low Ca:Al ratios because harvest methods can differentially affect nutrient cycling of the forest floor.
- As much as possible, all organic material should be left after any harvesting method to maximize the potential for re-supplying nutrients to the soil. Rather than clearing or removing downed trees, standing dead trees, and debris for firewood, it would be better to leave this material on the ground to decompose.
- Whole-tree harvesting after leaf fall reduced the potential drains of N, P, K, and Ca by 7, 7, 23, and 5%, respectively, compared with potential removal by harvesting during the growing season.
- Three measures are possible to mitigate Ca depletion reduction of acid deposition to preindustrial levels, restrictions on short-rotation whole-tree harvesting, and liming of vast forest areas on a scale similar to liming agricultural crops. Large-scale liming, perhaps at the same time as harvest, may be required if forest productivity is to be maintained at present levels.
- Full tree harvesting of hardwoods after leaf fall will remove less nutrients and in different proportions than harvesting when the trees are in full leaf. Removal of N, P and K would be halved, and most of the Ca and Mg would remain on the site (Freedman 1990) owing to the nutrient resorption characteristics of some hardwood species.

In other, more productive, soils on the Forest we suggest there is not conclusive evidence that whole tree harvest will affect soil productivity over our harvesting timelines. In response to possible increases in demand for alternative fuel sources during this planning period, we will allow whole tree harvesting on soils with higher buffering capacity and nutrient content. If research discovers that there are impacts from whole tree harvesting to less sensitive soils,

then project environmental analysis will show unacceptable reductions to soil productivity and design mitigations or alternatives to protect against these reductions.

c. Tentative Options or Proposed Actions for Change

- C-1. Modify the Forest Plan by deleting George Washington NF Plan Common Standard 216 and modifying current GWNF Common Standard 211, page 3-145 by adopting Jefferson National Forest Plan forestwide standard FW-5 that says: "On all soils dedicated to growing vegetation, the organic layers, topsoil and root mat should be left in place over at least 85% of the activity area and revegetation should be accomplished within 5 years." Also, modify the current GWNF Common Standard 215, page 3-146, to allow whole tree harvesting in stands identified as having moderate to low risk of nutrient depletion and acidification.
- C-2. Modify Common Standards 216 and 211 and do nothing to Common Standard 215.
- C-3. Do nothing.

5. What are the Consequences of Not Changing?

The Forests will lose an opportunity to more closely align the two Forest Plans regarding the issue of soil productivity on the Forest. It will limit our ability to provide alternative fuel sources to help offset U.S. dependence on foreign energy supplies.

Proposed Action

Propose Option C1.

6. Recommendations for Plan Revision

Modify the standards described above in revised Plan.

D. Water Quality

1. What was the Plan Striving For?

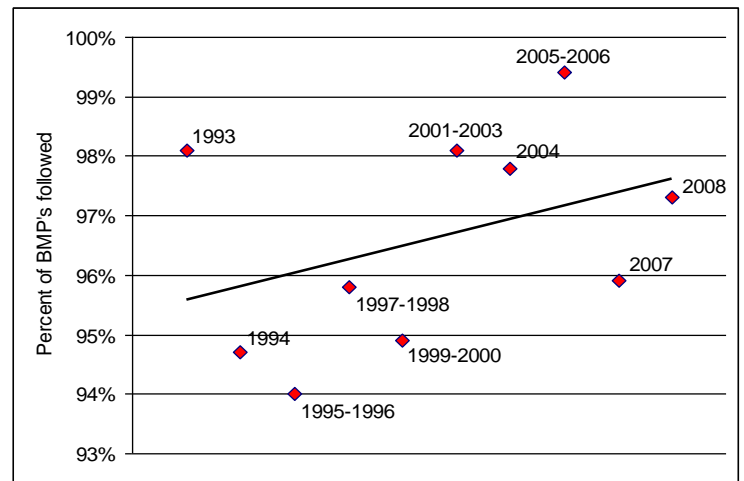
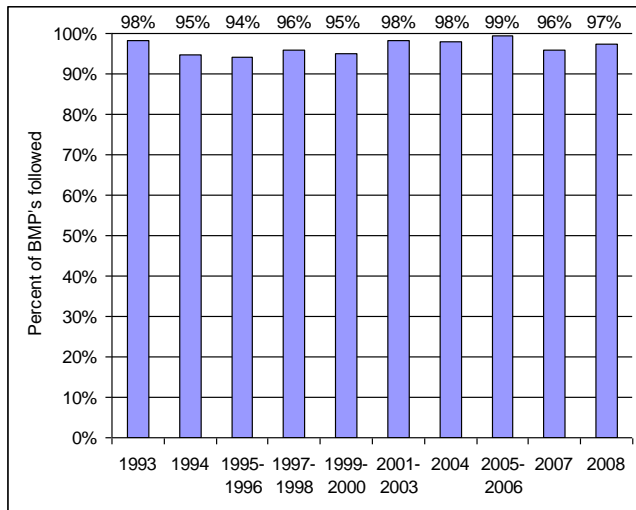
The Plan sought to maintain or improve water quality to meet demands for beneficial uses of water, both within and adjacent to the National Forest. To accomplish this goal the following measures were specified: In any project, water quality is protected from nonpoint source pollution through the use of standards that meet or exceed best management practices. On-site implementation of standards is monitored, as is their effectiveness in protecting water quality and maintaining the biological condition of streams. Results of monitoring are evaluated and practices adjusted as needed to protect beneficial uses. Watershed improvement projects are implemented in actively eroding areas where sediment is adversely affecting beneficial uses.

Specific objectives were: sedimentation rates are in equilibrium with the watershed and stabilize or improve the biological condition of the stream (EPA's Rapid Bioassessment Protocol II).

The Plan recognized that acid deposition, derived from off-Forest sources, was causing a decrease in alkalinities and a reduction in fish and aquatic insects in acid-sensitive streams. The Plan provided for mitigation through liming and other means on a very limited basis.

2. Where is the Plan Now?

Implementation Monitoring – Monitoring from 1993 to 2008 indicates that BMP implementation met or exceeded requirements 96.5 percent of the time.



Effectiveness Monitoring – Trends for aquatic macroinvertebrates were fully documented in Chapter 2 (Management Area 18) of the annual M&E reports since the 1997-1998 report.

Sample sites were selected downstream of management activity areas to monitor the impacts on stream health of projects including but not limited to timber sales and prescribed burns. Other samples were collected to create a baseline of stream conditions within the forest. Across the Forest, 728 samples were collected, analyzed and assigned an overall MAIS score (0-18). Of these samples, 84% were in the “good” and “very good” categories.

A paired t-test was used to compare the MAIS scores of 18 streams before and after timber harvests that occurred at various locations across the Forest. Only samples collected from March through the first week in June were compared to minimize seasonal variability in structure of macroinvertebrate communities. There was no significant difference between the pre and post timber harvest MAIS scores; both the pre and post mean scores were in the “Good” category (See Table below).

Paired samples t-test on pre and post MAIS scores from 18 different timber sales

Mean MAIS pre	16
Mean MAIS post	15
95% CI	-0.365 to 2.365
P value	0.140

A paired t-test was used to compare the MAIS scores of 7 streams before and after prescribed burn that occurred at various locations across the Forest. There was no significant difference between the pre and post prescribed burn MAIS scores; both the pre and post mean scores were in the “Good” category (see Table below).

Paired samples t-test on pre and post MAIS scores from 7 different prescribed burns

Mean MAIS pre	16
Mean MAIS post	16
95% CI	-1.098 to 1.669
P value	0.631

Chemical Water Quality Monitoring – Water quality in streams is a priority on the National Forest. Since 1988, almost 6,000 water samples have been analyzed from George Washington and Jefferson National Forest streams. Some streams have been part of a long term monitoring program and are sampled quarterly; others have had only one or two samples taken to characterize their chemical habitat. In response to concerns over the quality of water from the George Washington National Forest related to drinking water, Virginia water quality standards (State Water Control Board 2008) were compared to 5,532 water samples collected from streams on the national forest. To get a complete picture related to the public water supply water quality standards, measurements from both the George Washington and Jefferson National Forests, during all seasons, and all years were included in the analysis.

There are three chemical parameters listed in the Virginia water quality standards (VA WQS) that have been sampled consistently across the Forests; they are chloride, nitrate, and sulfate. A box and whisker plot was developed for each of these parameters from the National Forest dataset; in addition, the VA WQS was shown as a red horizontal bar in the charts. The top and bottom of the boxes in the plots represent the 25th and 75th percentiles (50% of all values fall within the box), the bar in the center of the box represents the median, whiskers represent the 10th and 90th percentiles (80% of all values fall within the whiskers), and closed circles represent the entire range of the data.

As seen in Charts 1-3, none of the 5,532 samples exceeded VA water quality standards for public water supply. In fact, as shown by the box, 90% of the samples are far below the water quality standard threshold.

Chart 1. Chloride measurements from 5,532 stream water samples taken on the GWJ National Forest related to the VA water quality standards for public water supply.

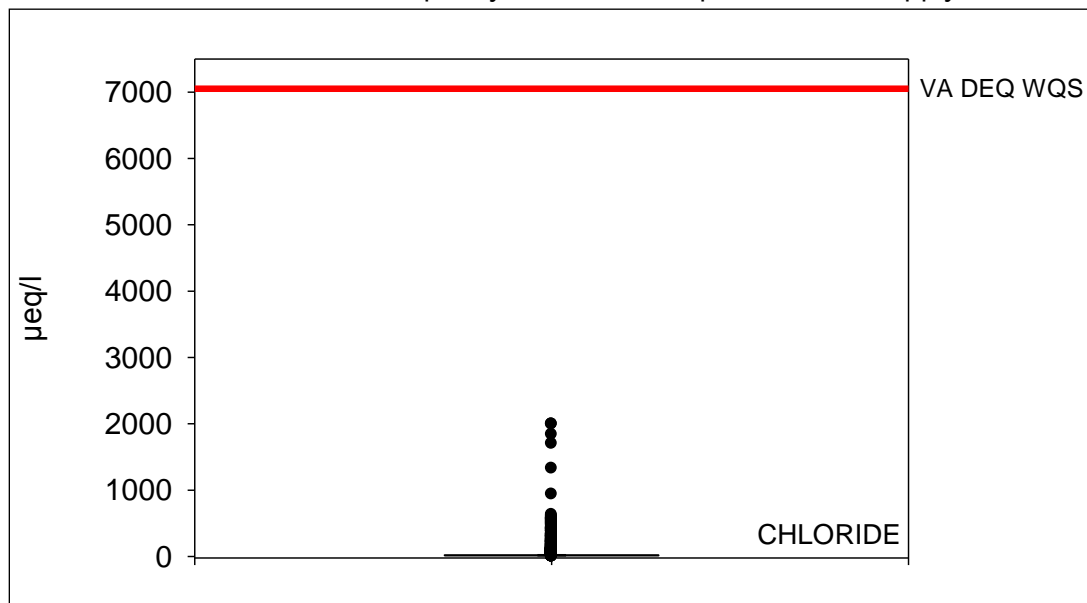


Chart 2. Nitrate measurements from 5,532 stream water samples taken on the GWJ National Forest related to the VA water quality standards for public water supply.

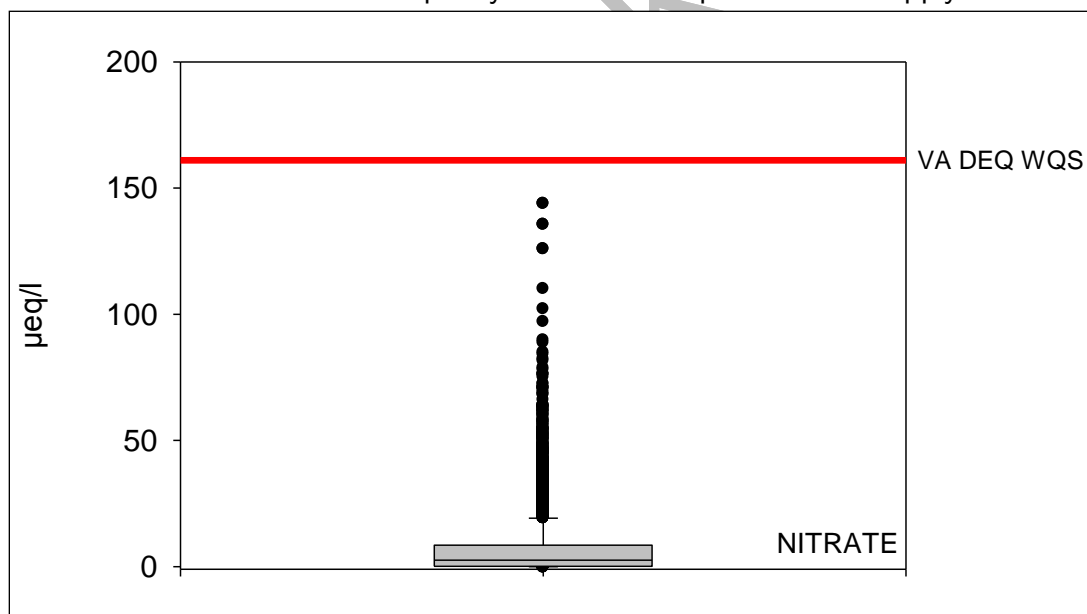
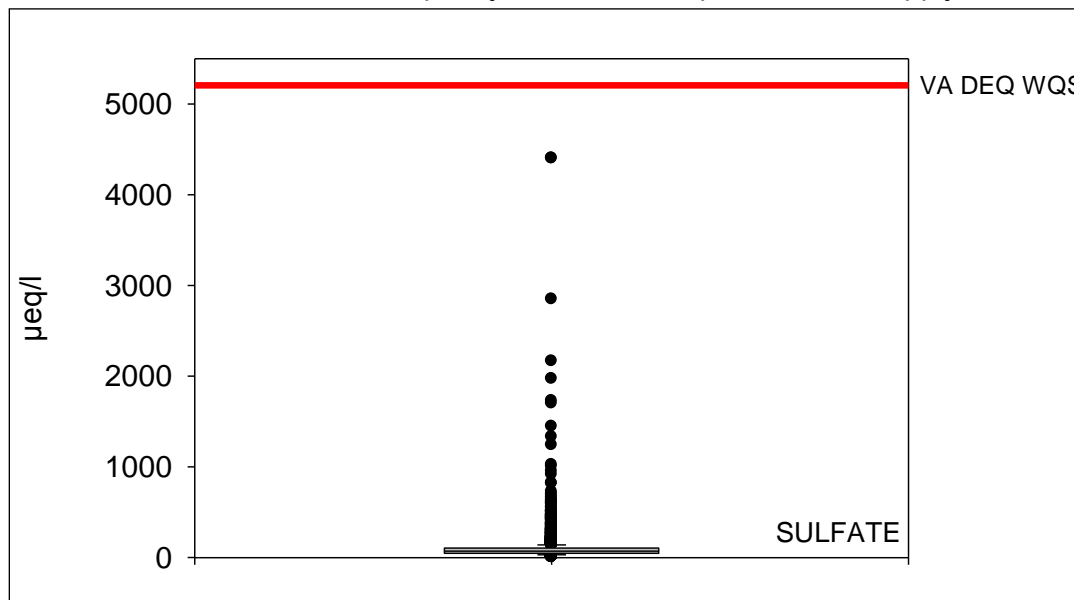


Chart 3. Sulfate measurements from 5,532 stream water samples taken on the GWJ National Forest related to the VA water quality standards for public water supply.



Reference:

2008. STATE WATER CONTROL BOARD. 9 VAC 25-260 Virginia Water Quality Standards. Statutory Authority: § 62.1-44.15 3a of the Code of Virginia. WITH AMENDMENTS EFFECTIVE October 2008

Impaired Streams – The 2008 303d reports for Virginia and West Virginia list 53 streams and 4 reservoirs on the Forest as being impaired. The sources of these impairments are off-Forest (including acid deposition), or are described as “natural.” None of the impairments can be attributed to Forest management activities.

Impaired waters on the George Washington National Forest

Water Name	Cat.	Use	Impairment	Source
Pedlar River	5A	Recreation	E. coli	Non-point source
Cub Run [10th Leg. quad]	4A	Recreation	Fecal coliform, E. coli	Agriculture, NPS, wildlife
Big Run	5A	Recreation	E. coli	Agriculture, NPS, wildlife
North River	5A	Aquatic Life	pH	Atmospheric deposition
Thorny Branch	4A	Recreation	Fecal coliform	Non-point source
Briery Branch	5C	Aquatic Life	pH	Natural conditions
Narrow Passage Creek	5A	Recreation	Fecal coliform	Agriculture, NPS, wildlife
Cedar Creek	5A	Aquatic Life	Benthic macro bioassessments	Unknown
Loves Run	5A	Aquatic Life	pH	Atmospheric deposition
Pine Run	4A	Recreation	E. coli	NPS, wildlife
Back Creek	5A	Aquatic Life	Benthic macro bioassessments	Unknown
South Fork Shenandoah R	5A	Fish Consumption	Mercury in fish tissue	Contaminated sediments

Water Name	Cat.	Use	Impairment	Source
Falls Hollow	4C	Aquatic Life	Benthic macro bioassessments	Drought-related impacts
Tunnel Hollow x-trib	4C	Aquatic Life	Benthic macro bioassessments	Drought-related impacts
Beaver Creek	4A	Recreation	Fecal coliform	NPS, wildlife
Beaver Creek	4C	Aquatic Life	Temperature	Natural conditions
Rocky Run	5A	Aquatic Life	pH	Atmospheric deposition
Union Spring Run	5A	Aquatic Life	pH	Atmospheric deposition
Wolf Run	5A	Aquatic Life	Benthic macro bioassessments	Atmospheric deposition
Wolf Run	5A	Aquatic Life	pH	Atmospheric deposition
Dry River	5A	Aquatic Life	pH	Atmospheric deposition
Skidmore Fork	4C	Aquatic Life	Benthic macro bioassessments	Drought-related impacts
Coles Run	5A	Aquatic Life	pH	Atmospheric deposition
Johns Run	5A	Aquatic Life	pH	Atmospheric deposition
Kennedy Creek	5A	Aquatic Life	pH	Atmospheric deposition
Mills Creek	5A	Aquatic Life	Benthic macro bioassessments	Atmospheric deposition
Orebank Creek	5A	Aquatic Life	pH	Atmospheric deposition
Toms Branch	4C	Aquatic Life	Benthic macro bioassessments	Drought-related impacts
Cub Run [Elkton W quad]	5A	Recreation	Fecal coliform, E. coli	Agriculture, NPS, wildlife
Boone Run	5A	Recreation	Fecal coliform	NPS, wildlife
Little Dry River	4A	Recreation	Fecal coliform	NPS, wildlife
Little Dry River	5A	Aquatic Life	pH	Atmospheric deposition
Fridley Run	5A	Aquatic Life	Benthic macro bioassessments	Atmospheric deposition
Fridley Run	5A	Aquatic Life	pH	Atmospheric deposition
Mountain Run	4A	Recreation	Fecal coliform, E. coli	Agriculture, NPS, wildlife
Mountain Run	5A	Aquatic Life	Benthic macro bioassessments	Atmospheric deposition
Mill Creek [R'ham Co.]	4A	Recreation	Fecal coliform	Agriculture, NPS, wildlife
Mill Creek [R'ham Co.]	4A	Aquatic Life	Benthic macro bioassessments	Unknown
Laurel Run [Shen Co.]	5A	Aquatic Life	Benthic macro bioassessments	Atmospheric deposition
Little Stony Creek	5A	Aquatic Life	Benthic macro bioassessments	Atmospheric deposition
Stony Creek	4A	Recreation	Fecal coliform	Agriculture, NPS, wildlife
Stony Creek	5A	Aquatic Life	Benthic macro bioassessments	Agriculture, NPS, wildlife
Stony Creek	5A	Aquatic Life	Temperature	Unknown
Passage Creek	5A	Recreation	Fecal coliform	Agriculture, NPS, wildlife
Tye River	5A	Aquatic Life	Temperature	Unknown
Tye River South Fork	5A	Aquatic Life	Temperature	Unknown
Jackson River	5C	Aquatic Life	Temperature	Natural conditions
Jackson River	5A	Recreation	E. coli	NPS, wildlife
Laurel Run [Bath Co.]	5A	Aquatic Life	pH	Atmospheric deposition
Panther Run	4C	Aquatic Life	Benthic macro bioassessments	Drought-related
Pheasanty Run	4A	Aquatic Life	Benthic macro bioassessments	Aquaculture (permitted)
Porters Mill Creek	5A	Aquatic Life	pH	Atmospheric deposition
South Fork Pads Creek	4C	Aquatic Life	Benthic macro bioassessments	Drought-related
Calfpasture River	5A	Recreation	E. coli	Agriculture, NPS, wildlife
Mill Creek [Bath Co.]	5A	Recreation	Fecal coliform, E. coli	Agriculture, NPS, wildlife
Little Calfpasture River	5A	Recreation	Fecal coliform	NPS, wildlife
Saint Marys River	5A	Aquatic Life	pH	Atmospheric deposition
Wilson Creek	5C	Aquatic Life	Temperature	Drought-related impacts; unknown
Potts Creek	5A	Recreation	E. coli	Livestock, septic systems, wildlife
Potts Creek	5C	Aquatic Life	pH (> 9.00)	Unknown
Coles Run Reservoir	5A	Aquatic Life	pH	Atmospheric deposition

Water Name	Cat.	Use	Impairment	Source
Elkhorn Lake	5A	Aquatic Life	pH	Atmospheric deposition
Staunton Dam Lake	5A	Aquatic Life	pH	Atmospheric deposition
Switzer Lake	5A	Aquatic Life	pH	Atmospheric deposition
Switzer Lake	5A	Aquatic Life	Temperature	Unknown
Capon Run	5		Biological	Unknown
Hawes Run	5		Biological	Unknown
Miller Run	5		Biological	Unknown

Category 4A - water is impaired or threatened for one or more designated uses; TMDL has been completed.

Category 4C - impairment is not caused by a pollutant and/or is caused by natural conditions; no TMDL is required.

Category 5A - water is impaired or threatened for one or more uses by a pollutant(s); TMDL is required.

Category 5C - water quality standard is not attained due to "suspected" natural conditions; may require a TMDL; WQ Standard may be reevaluated due to the presence of natural conditions.

Category 5 – water is impaired, and a TMDL is needed (West Virginia).

The 2008 Water Quality Assessment for Virginia lists 54 impairments on the Forest, affecting 50 streams and four reservoirs. For 11 of the stream impairments, the cause is a natural condition, and no Total Maximum Daily Load (TMDL) allocation is required; or the cause is a “suspected” natural condition, and a TMDL may or may not be required. For another 21 stream impairments, the source is atmospheric deposition.

For all the other 28 stream impairments, much more of the stream’s length is on private land than on Forest Service land, and almost all the samples on which these impairments were based were collected miles downstream from Forest Service land. The predominant sources for these impairments are agriculture, nonpoint sources, and wildlife. For seven impairments, the source is listed as unknown.

TMDL reports have been completed for five of the impairments. One deals with aquaculture. The other four, which are for bacteria, identify agriculture as the main source of pollution, with wildlife as a secondary source. None of these TMDL reports identify activities related to forest management as a significant source.

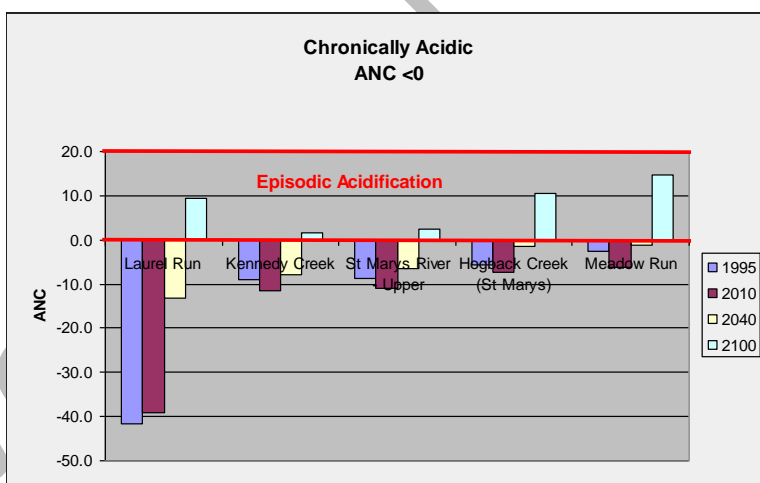
In summary, none of the stream impairments can be attributed to Forest management activities.

For Coles Run Reservoir, Elkhorn Lake, Staunton Dam Lake, and Switzer Lake, the impairment is low pH, due to atmospheric deposition. Switzer Lake is also listed with a temperature impairment, with the source being unknown. Again, none of the impairments can be attributed to Forest management activities.

The 2008 West Virginia Integrated Water Quality Monitoring and Assessment Report lists three impaired streams that are on the Forest: Capon Run, Hawes Run, and Miller Run. For all of these streams, the criterion affected is biological, the source is unknown, and a TMDL is needed. For each of these, most of the stream’s length is on private land, and the impairment cannot be attributed to Forest management activities.

Acid Deposition– Water quality has been systematically monitored on Forest streams since 1987. As expected, the general water quality of any given stream is strongly tied to the underlying geology coupled with prevailing air quality. The collected data has been used to determine trends and changes in stream water composition, and to project the future chemical status of native trout streams. A 1998 report (Bulger et al. 1998) found that of the study streams in non-limestone geology, 50 percent are “non-acidic.” An estimated 20 percent are extremely sensitive to further acidification. Another 24 percent experience regular episodic acidification at levels harmful to brook trout and other aquatic species. The remaining 6 percent of streams are “chronically acidic” and cannot host populations of brook trout or any other fish species. Modeling conducted by the Southern Appalachian Mountain Initiative (SAMI) and reported in their 2002 publication on acid deposition showed that even with the sulfate deposition declining considerably, as new air regulations are implemented, stream recovery will be slow or non-existent over the next 100 years. Chronically acidic streams may improve slightly and be only episodically acidic by 2100, but they will still be marginal for brook trout.

Due to the lengthy recovery time anticipated for acidified streams on the Forest, selective liming to improve water chemistry will continue to be considered.

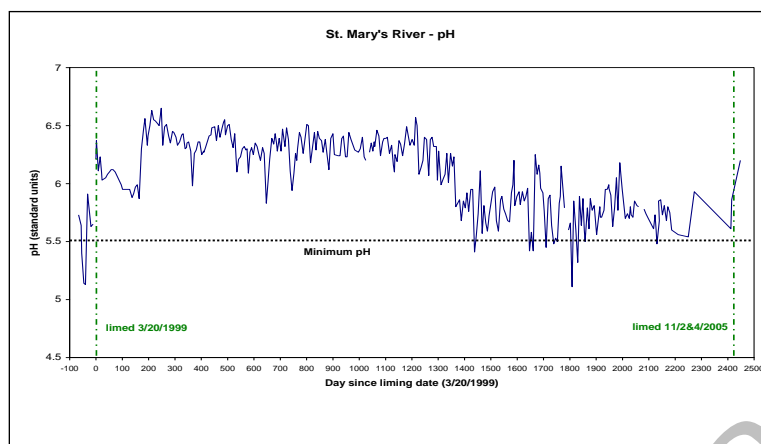


The following streams have been limed on the GW Forest since 1989:

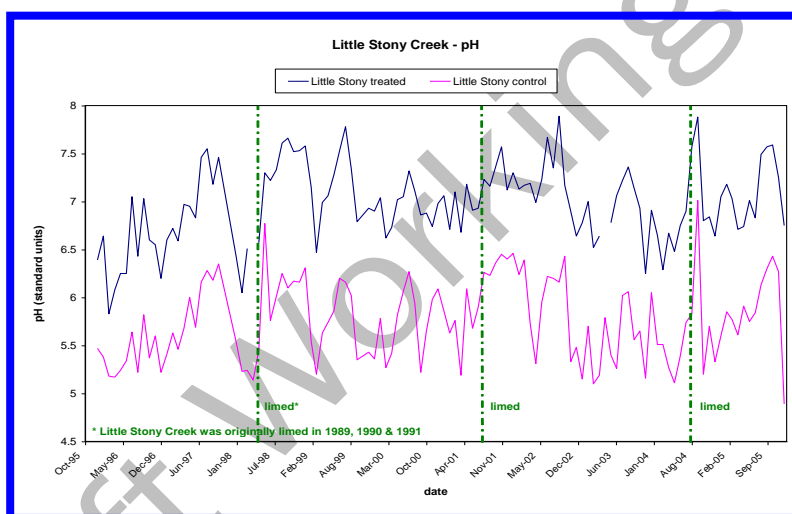
George Washington National Forest Stream and Lake Liming

Date	Stream	County
1990, 1997	Cedar Creek	Shenandoah
1993, 1994, 1997	Laurel Run	Shenandoah
1997, 2000, 2003, 2006	Little Passage Creek	Shenandoah
1989, 1990, 1991, 1998, 2001, 2004, 2007	Little Stony Creek	Shenandoah
1990, 1998, 2001, 2007	Mill Creek	Shenandoah
1993, 1997, 1999, 2002, 2005, 2008	Mountain Run	Rockingham
1999	St. Mary's River & 5 tribs	Augusta
2005	St. Mary's River & 6 tribs	Augusta
1995, 1996, 1997, 1998, 1999	Trout Pond Run	Hampshire, WV

Trends in pH for several of the limed streams are shown below.



Additional trend information on the effects of acidification and liming is documented in Appendix G, Brook Trout and Wild Trout section, of the annual M&E reports since the 1997-1998 report.



Reference watershed – There are no reference watersheds designated in the Forest Plan. Reference watersheds would be representative of those watersheds in which existing water quality conditions are considered to be the “best attainable” for the ecological sub-section under relatively undisturbed, natural conditions. Monitoring of water quality and other stream characteristics would provide reference conditions against which other watersheds could be compared. Reference watersheds for high gradient Forest streams would complement reference watersheds for low gradient streams that are being monitored by the Virginia Department of Forestry. The following criteria were used to evaluate potential reference watersheds:

- Perennial flow – based on fisheries designations in the “streams” GIS layer
- Management Areas that maintain relatively undisturbed conditions, with a low level of human intervention or impact

- Past monitoring – preferably with Virginia Trout Stream Sensitivity Study (VTSSS) sites
- Good water quality
- Accessibility
- A range across ranger districts and physiographic provinces

Based on the above criteria, the following is a list of potential watersheds on the [north half](#) and [south half](#) of the GWNF. All of these have VTSSS monitoring sites.

- North Fork Simpson Creek – James River RD
- Little Cove Creek – Glenwood/Pedlar RD
- Morgan Run – Lee RD
- Ramseys Draft – North River RD
- Lost Run – Warm Springs RD

Morgan Run and North Fork Simpson Creek, however, have some low pH and ANC measurements. Possible alternatives to Morgan Run on the Lee RD are Browns Run and upper Boone Run; but upper Boone Run has no past monitoring and has 79 acres of private land.

On the James River RD, an alternative to North Fork Simpson Creek might be Dolly Ann Hollow, but there has been little monitoring there, and the geology and preliminary sampling indicate that it might have similar problems with pH and ANC.

Other potential reference watersheds might be Jerkemtight Branch and Little River on the North River RD. Jerkemtight Branch watershed includes 563 acres of currently suitable timberland in MA 15. The 1949 flood caused debris flows in the Little River watershed, and the stream channels may not be fully stabilized.

None of the alternative watersheds have VTSSS monitoring sites.

Potential Reference Watersheds
By Management Area and Timber Suitability

Potential Reference Watershed	4A	4E	5B	6	7B	8	9B	14A	14C	15A	15C	16D	21B	21C	21D	Total
Land Suitable for Timber Production	No	No	No	No	Yes	No	No	No	Yes	No	Yes	Yes	No	No	No	
Browns Run*	1,084		3					159	9		26					1,281
Lost Run													592			592
Morgan Run							817									817
Boones Run*			79				1,497									1,576
Ramseys Draft						6,290	8									6,298
Jerkentight Branch							1,649			1	563					2,213
North Fork Simpson Creek						1,883	17									1,900
Dolly Ann Hollow	1,072				1		242									1,315
Little Cove Creek				194										673		867
Little River		36										6			9,970	10,012
Totals	2,156	36	82	194	1	8,173	4,230	159	9	1	589	6	592	673	9,970	26,871
For Boones Run, all 79 acres of 5B are private; for Browns Run, 13 acres of 4A are private and 7 acres of 14A are private.								Total Suitable Timber Land Acres Potentially Affected is 605								

3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes. Monitoring indicates that the Plan is protecting water quality during management activities. Additionally, several streams were limed to improve water chemistry in acidified streams. Restoration projects were implemented in a number of areas where active erosion was affecting water quality.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? Designation of reference watersheds is desirable to facilitate the collection of water quality data that can be used as a reference data set.

Other changes (beyond those suggested under Riparian Areas) are not needed. Monitoring indicates that the Plan is protecting water quality during management activities. Sources of stream acidification are beyond the Forest's control. The Plan provides for mitigation of stream acidification through liming.

c. Tentative Options or Proposed Actions for Change

C-1. Designate reference watersheds and establish as separate management areas the following five locations so that there is one per Ranger District: North Fork Simpson Creek, Little Cove Creek, Morgan Run, Ramseys Draft, and Lost Run.

C-2. Designate the same locations above as reference watersheds; acknowledging they lie beneath other existing and compatible Plan management areas (as in the Jefferson Forest Plan).

5. What are the Consequences of Not Changing?

Without reference watersheds, there will be a lack of reference water quality data that can be compared to data from watersheds with more disturbances or management such as those watersheds that have been prescribed burned. Reference watersheds are included in the Jefferson Forest Plan, but these are not representative of all ecological sub-sections on the GW. Coordination with the Department of Forestry in water quality monitoring will be less complete.

Proposed Action

Propose Option C2.

6. Recommendations for Plan Revision

Identify the locations of the reference watersheds in the revised Plan.

G. Fire

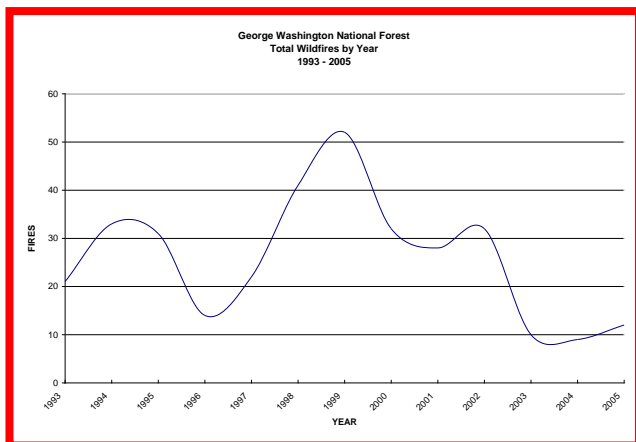
1. What was the Plan Striving For?

The 1993 GW Plan addressed wildland fire suppression by stating that, "Wildfires are suppressed (either through confinement, containment or immediate control) using the least cost methods commensurate with the resource values at risk, the potential for human injury, the management area suppression objectives and the availability of manpower and equipment" (Plan page 2-32.)

Prescribed fire was addressed to achieve specific management objectives. A burning program of approximately 3,000 acres per year was to improve fire-dependent ecosystems and wildlife habitat, maintains open areas along the Appalachian Trail, and restore and maintain some threatened, endangered, and sensitive species habitats (Plan page 2-32).

2. Where is the Plan Now?

Managing unplanned ignitions for resource benefits was not discussed because it was not a fire management option in 1993.



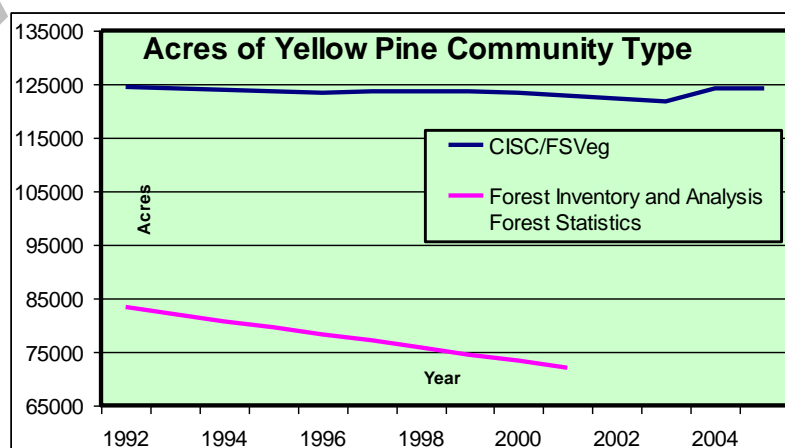
Wildland fire occurrences vary greatly from year-to-year. Annual variations and cycles in weather have an effect on fuels and lightning caused ignitions and hence the number of fire starts and eventual size. Analysis of climatic fluctuations shows that dry (sometimes drought) conditions occur about every 5-6 years which lead to periods of sustained high fire danger and subsequent high fire occurrence. Typically, it is during these years that the George Washington National Forest has experienced its largest fires. Between these dry

years wetter conditions exist that lead to fewer wildland fires, but in turn create opportunities for increased prescribed fire activities. Conversely the Forest's years of higher wildland fires are also the years where a limited number of prescribed fire acres are typically accomplished.

YELLOW PINE COMMUNITY - The Yellow Pine Forest Community (combined forest types dominated by yellow pine tree species) was selected as a Management Indicator Species in the GWNF Plan because it is an important element of plant and animal diversity and is a fire-dependent habitat type (GWNF FEIS, page J-12) that may be influenced by management activities. This forest community type consists of pitch, table mountain, Virginia, and shortleaf pine forests and woodlands. This community is dependent on recurrent fire for maintenance and regeneration.

To track the yellow pine community the GWNF CISC/FSVeg database and Forest Inventory data on forest types and acres was used. Based on CISC/FSVeg information the number of acres of yellow pine forest types across the GWNF has been decreasing to stable over the past 13 years. Forest Inventory data from 1982 to 2001 shows a more dramatic decrease in the number of acres of the yellow Pine Community. The lack of fire coupled with the ever-increasing beetle activity accounts for what is likely a downward trend in the number of acres (quantity) and in stand condition (quality) of this management indicator.

The Yellow Pine Forest Community (combined forest types dominated by yellow pine tree species) was selected in the GWNF Plan because it is an important element of plant and animal diversity and is a fire-dependent habitat type (GWNF FEIS, page J-12) that may be influenced by management activities. This forest community type consists of pitch, table mountain, Virginia, and shortleaf pine forests and woodlands. This community is dependent on recurrent fire for maintenance and regeneration.



The yellow pine community is typically found on south to southwest facing ridges and slopes. These areas are well drained and receive maximum solar radiation, and are exposed to prevailing winds making them more prone to desiccation and are hence drier. While pines dominate the overstory, shrubs such as mountain laurel, blueberry, huckleberry, teaberry, azaleas, wintergreen, fetterbush, mulberry, minniebush, and trailing arbutus dominate the understory. These shrubs have waxy leaves and most are evergreen. This combination of dry, windy site conditions, and the volatile chemical nature of resinous pines and waxy/oily shrubs, which retain their foliage year-round, makes them conducive to burn. In fact, most occurrences of this community are maintained by fire and must be disturbed periodically in this way to regenerate and maintain a structure of an open midstory with a shrub/grass understory and patchy overstory (USDA 1996, Williams 1988). Without fire this community will become dominated by hardwoods (oaks) or white pine (which is a "soft" pine) and the openness of typical yellow pine stands will be lost as it closes in with thick understory and midstory vegetation. Many plant species that occur in this community are also adapted to fire for seed release and flowering. The cones of table mountain pines open and release their seeds when exposed to high heat. Blueberries and huckleberries are stimulated to rapid growth from underground stems (rhizomes) and subsequent flowering once top killed by fire. Therefore the species composition and vertical structure relies on the periodic disturbance of fire.

For purposes of this analysis, the amount and distribution of the yellow pine community is most likely to be influenced by the lack of disturbance in the absence of fire and those management activities associated with prescribed fire. Disturbance events that affect this community but are not necessarily direct management activities include episodes of bark beetle infestations and wildland fire occurrences of human or lightning origin.

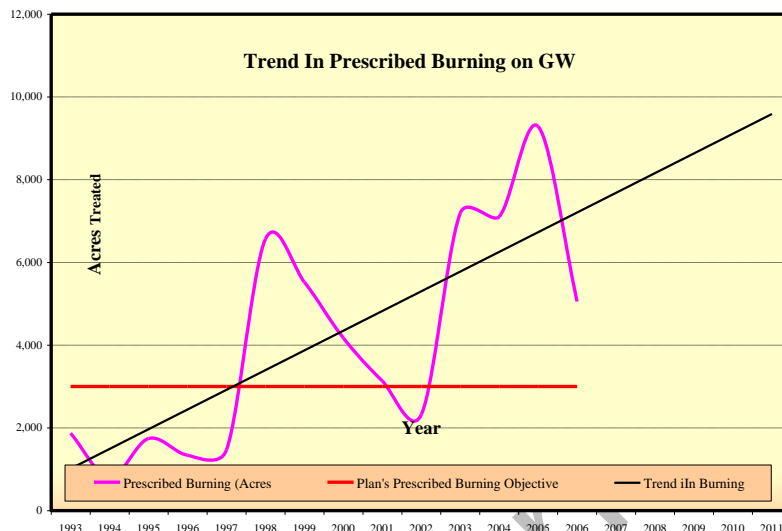
To track the yellow pine community the GWNF CISC database and Forest Inventory data on forest types and acres was used. Based on CISC information the number of acres of yellow pine forest types across the GWNF has been decreasing to stable over the past 12 years. The changes may be greater than indicated due to the inventory technique used in CISC coupled with recent ongoing natural changes in those eight forest types that are not reflected in these acreage figures. More than 85% of the yellow pine stands on the GWNF are over 80 years old. As these pine dominated stands age they become more susceptible to bark beetle infestations. This combined with the lack of fire occurrences in these stands (both wildfire and prescribed fire), where no more than 3% has burned over the past 15 years, has lead to increased stress from competition with non-yellow pine tree species in the understory and has lead to a rapidly increasing pine overstory mortality and ever-increasing fuel loads. These pine dominated stands require periodic fire for regeneration since the effects of burning result in opening the canopy to increased sunlight on the forest floor, killing thin-barked fire intolerant / shade tolerant trees that compete with pine seedlings, and in the case with table-mountain pine, heat from a fire opens serotinous cones allowing for seed release and dissemination. The lack of fire coupled with the ever-increasing beetle activity accounts for what is likely a downward trend in the number of acres (quantity) and in stand condition (quality) of this management indicator.

Agency management activities are limited to prescribe burning and managing fire within these forest types. Control or suppression of pine bark beetles, by means other than timber salvage harvesting, has not been done due to prohibitive costs and negative impacts to other associated animal species. While the acres of prescribed fire have increased in recent years the number of acres burned that have been targeted at restoring the yellow pine community have not kept up with the downward decline in total number of acres and regeneration of yellow pine trees. Thus while current Forest Service management activities are attempting to increase the Yellow Pine Community in some areas, not enough prescribed fire is occurring Forestwide and the overall decreasing trend in habitat quality and total acreage is likely to continue. Overall, viability of species dependent on the Yellow Pine Community is a concern on the GWNF. Amount of yellow pine acreage is expected to continue to decrease in the near future.

Recommendations in revising the GW Plan include implementation of more prescribed fire and unplanned ignitions managed for resource benefits in those areas with a yellow pine component.

3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes. Prescribed fire exceeded the Forest's yearly objective of 3,000 acres per year. Prescribed fire is any fire intentionally ignited to meet specific land management objectives, such as to reduce accumulated flammable fuels, or restore ecosystem health. Prescribed fire is a management tool that when used under specifically controlled conditions helps land stewards manage forests for multiple uses.



Prescribed fires are used on public lands in order to improve forest health, and reduce large wildfires. Prescribed fire is used only under appropriate conditions and in appropriate sites. Fire plays an important and critical role in influencing vegetation and the lifecycles of trees and plant communities. Many species are dependent on fire. Prescribed fire helps the Forest Service achieve

improved forest health and will help reduce the threat of large fire events. Prescribed fire allows the Forest Service to control the effects of fire, its location and intensity. Prescribed fires are used to reduce the intensity and magnitude of bigger wildfires by reducing the accumulation of flammable fuels.

Current estimates indicate that at least 90% of the GW is in Condition Class 3 which is highly departed from natural vegetation-fuel composition and fire frequency severity.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? The National Fire Plan (NFP) was developed in August 2000, following a landmark wildland fire season, with the intent of actively responding to severe wildland fires and their impacts to communities while ensuring sufficient firefighting capacity for the future. The NFP addresses five key points: firefighting, rehabilitation, hazardous fuels reduction, community assistance, and accountability.

Subsequently, in January 2001 a list of communities at risk was issued in the Federal Register. This notice provides an initial list of urban wildland interface communities in the vicinity of Federal lands that are at high risk from wildfire. Using only Virginia Department of Forestry data that continues to evolve from the initial Federal Register notice, about 66 [woodland communities](#) are within ½ mile of the National Forest System boundary while an additional 33 are within 1 ½ miles.

The National Fire Plan spawned the 10-Year Comprehensive Strategy issued in August 2001. This strategy reflects the views of a broad cross-section of governmental and nongovernmental stakeholders. It outlines a comprehensive approach to the management of wildland fire, hazardous fuels, and ecosystem restoration and rehabilitation on Federal and adjacent State, tribal and private forest and range lands in the United States. This strategy emphasizes measures to reduce the risk to communities and the environment and provides an effective framework for collaboration.

The primary goals of the 10-Year Comprehensive Strategy are:

1. Improve Prevention and Suppression
2. Reduce Hazardous Fuels
3. Restore Fire Adapted Ecosystems
4. Promote Community Assistance

Furthermore, the Healthy Forests Initiative (HFI) was launched in August, 2002 with the intent to reduce the risks severe wildfires pose to people, communities, and the environment. By protecting forests, woodlands, shrub lands, and grasslands from unnaturally intensive and destructive fires, HFI helps improve the condition of public lands, increases firefighter safety, and conserves landscape attributes valued by society.

In addition, the incentive for communities to engage in comprehensive forest planning and prioritization was given new and unprecedented impetus with the enactment of the Healthy Forests Restoration Act (HFRA) in January 2003. This landmark legislation includes the first meaningful statutory incentives for the US Forest Service (USFS) and the Bureau of Land Management (BLM) to give consideration to the priorities of local communities as they develop and implement forest management and hazardous fuel reduction projects. In order for a community to take full advantage of this new opportunity, it must first prepare a Community Wildfire Protection Plan (CWPP).

Community Wildfire Protection Plans may address issues such as wildfire response, hazard mitigation, community preparedness, or structure protection—or all of the above.

The National Fire Plan and all its accompanying policies and acts have set forth a process where the Federal Agencies and local communities discuss issues like wildland fire response, hazard mitigation, community preparedness, and structure protection then develop a Community Wildfire Protection Plan (CWPP). The agencies would then give consideration to prioritize fuels treatments where these CWPP were developed.

In January 2001, the Federal Wildland Fire Management Policy was implemented and is further clarified by the 'Guidance for Implementation of Federal Wildland Fire Management Policy' issued in February 2009. In part, this policy allowed for wildland fire to be recognized as an essential ecological process and natural change agent that can be used to protect, maintain and enhance resources. Managing unplanned ignitions for resource benefits is designed to allow naturally (i.e. lightning) ignited wildland fires to burn in a natural state providing resource benefits to the ecosystem, based on objectives established in the Forest Plan.

Finally, an important need for change is the recognition of the role and extent that fire historically played in shaping Appalachian ecosystems and the myriad of plant and animal species they support. Recent research across the GWJNF using dendrochronology and fire-scarred trees show that from the early 1700's until the 1930's 75% of fires occurred in areas dominated by yellow pine, yellow pine-oak, and oak-yellow pine at a lower and upper level of 1 – 9 years. These were typically low

intensity understory fires but more intense stand replacement fires occurred approximately 75 to 100 years, likely during times of very dry fuel conditions. Fires occurring at approximately this level of frequency would shift what is now a closed canopy, dense midstory forest with numerous shade tolerant and fire-intolerant trees such as red maple and white pine towards a more open woodland with many canopy gaps and an open midstory and favor trees, shrubs and grasses such as oaks, blueberries, huckleberries, and bluestems that are adapted to increased levels of sunlight.

Land management agencies have done a tremendous job educating the public about the dangers of wildland fire and reducing the number of human caused fires. However, it is important to realize that not all fire is bad. In fact, many of GWNF ecosystems are dependent on fire.

1. Fire historically crept through these areas with low intensity.
2. Every 5 to 9 years, fire regenerated the forest and cleansed the under story of potential hazardous fuels. These historic fires were not the devastating wildfires of recent years. Frequent cool fires acted as a natural agent reducing surface fuels and all but eliminated large, stand replacing, fire events that have become too frequent during the last three decades.
3. Open woodlands supported many plants and animals now rare or of public interest such as table mountain pine, golden-wing warblers, turkeys, blueberries, and whitetail deer. The [Bird Conservancy](#) has identified eastern deciduous forests of early successional habitat as one of the most threatened bird habitats in the United States.

The Forest Service has made it a priority to reintroduce fire into fire dependent ecosystems to help promote ecosystem health. Prescribed fire is viewed by the land management agencies as an agent of change that helps return an ecosystem to its historic range.

Fire has been a natural part of this forest's ecosystem for a very long time. Throughout time wildfires ignited and burned naturally throughout the forest. Some were caused by lightning and some were intentionally started by Native Americans. These low intensity fires in the past kept the forest floor free from the natural annual build up of tree needles, dead grass, thick brush, and dead trees. As a result, fire has shaped vegetation patterns and wildlife distributions in the National Forest (Lynch 1999, Brown 2000, Brown 2004, Patterson).

The absence of wildland fire has allowed unnatural amounts of forest fuels to accumulate, what once were open woodlands to become closed forests, and allow some invasive plant species to move into areas and disrupt ecosystem diversity and functioning. The emphasis should be to return the Forest to its natural biodiversity which will improve forest health and lower the risk of catastrophic high intensity fires. Managing unplanned ignitions for resource benefits is one means to restore and maintain that biodiversity.

By increasing the Forest's prescribed fire objective, the forest can begin to move towards a Condition Class 2 and eventually Condition Class 1 where we are within the natural or historic range of vegetation and fuel composition as the result of more frequent and lower severity fires. An increased objective on using prescribed fire, particularly in those

areas where the current ecosystem condition has departed markedly (Fire Regime Condition Class 3) from historic reference conditions (FRCC I) and where Wildland Urban Interface (WUI) meets National Forest managed lands.

c. Tentative Options or Proposed Actions for Change

C-1. Modify the Forest Plan by:

- a) Identifying that unplanned ignitions may be managed for resource benefits is a suitable use everywhere on the George Washington National Forest, acknowledging that the safety of firefighters and general public and the protection of life and property are the highest priorities: and if a lightning fire breaks out, procedures in the [Wildland Fire Use Implementation Procedures Reference Guide](http://www.nifc.gov/fire_policy/pdf/wildland_fire_use_guide.pdf) http://www.nifc.gov/fire_policy/pdf/wildland_fire_use_guide.pdf will be used.
- b) Increasing the prescribed fire objective to an annual program of 10,000 to 15,000 acres on the GW.
- c) Identifying a forestwide desired condition by adopting Jefferson Forest Plan goal #18 that says "Fire regimes are within their historical range as defined by Condition Class 1. Condition class is a function of the degree of departure from historical fire regimes resulting in alterations of key ecosystem components such as species composition, stand structure, successional stage, stand age, and canopy closure. Fire regimes in Fire Condition Class 1 are within historical ranges. Vegetation composition and structure are intact. The risk of losing key ecosystem components from the occurrence of wildland fire remains relatively low."
- d) Increasing the prescribed fire objective on the Forest to begin to restore the Yellow Pine Community Type.

C-2. Do nothing. Maintain current prescribe burning objective of 3,000 acres per year.

5. What are the Consequences of Not Changing?

The GW National Forest uses prescribed fire and mechanical treatments to reduce the risk of unwanted wildland fire, improve wildlife habitat, and increase oak regeneration in the Central Appalachian Mountains. The historic suppression of fire has resulted in a lack of periodic, lower intensity fire in the forest. The absence of these low intensity fires has increased the risk of large fire events and, we believe, has negatively impacted the health of the forests.

Due to successful prevention and suppression efforts, fire patterns were markedly altered during the past century. In the absence of fire, massive insect and disease epidemics and various other forest health problems have proliferated and can continue. Unmanaged wildfires threaten public safety, impair forest and ecosystem health, and degrade air quality. The absence of periodic, low intensity fires have increased the risk of large fire events and has negatively impacted the health of the GWNF forests.

Unmanaged wildfires can pose serious threats to public health and safety, as well as to air quality. Because the fires are uncontrolled, they pose significant threats to the safety of firefighters and general public and destroy property. The intense or extended periods of smoke associated with uncontrolled fires can also cause serious health problems and significantly decrease visibility.

Fire exclusion practices have resulted in forests being plagued with a variety of problems, including overcrowding resulting from encroachment of species normally eliminated by fire; vulnerability of trees to insects and disease; and inadequate reproduction of fire resistant species. In addition, heavy accumulation of fuel – dead vegetation of forest floors– can cause catastrophic fires, threaten public safety, impair forests and ecosystem health, and degrade air quality.

In summary, the consequences of limiting prescribed fire and managing unplanned ignitions is that greater concentrations of hazardous fuels, continued decline in forest health, increased risk of smoke pollutants, and the increased risk to the Wildland Urban Interface.

Proposed Action

Propose Option C1.

6. Recommendations for Plan Revision

Define and identify fire's role, including unplanned ignitions, in the ecosystem. Include the intent of Jefferson Forest Plan goal #18 in the desired condition for the revised Plan. Also acknowledge that some of the Forest will be suitable for the use of unplanned ignitions to restore and maintain desired ecological conditions and that safety of firefighters and general public and the protection of life and property are the highest priorities. Define the values to be protected from and/or enhanced by managing unplanned ignitions. Increase the objective for planned wildfire to meet restoration and maintenance needs for the yellow pine community and other vegetative communities across the Forest. As a strategy continue work with partners including The Nature Conservancy to improve understanding of the need for managing wildfire and to manage unplanned ignitions for resource benefits across the landscape.

H. Air

1. What was the Plan Striving For?

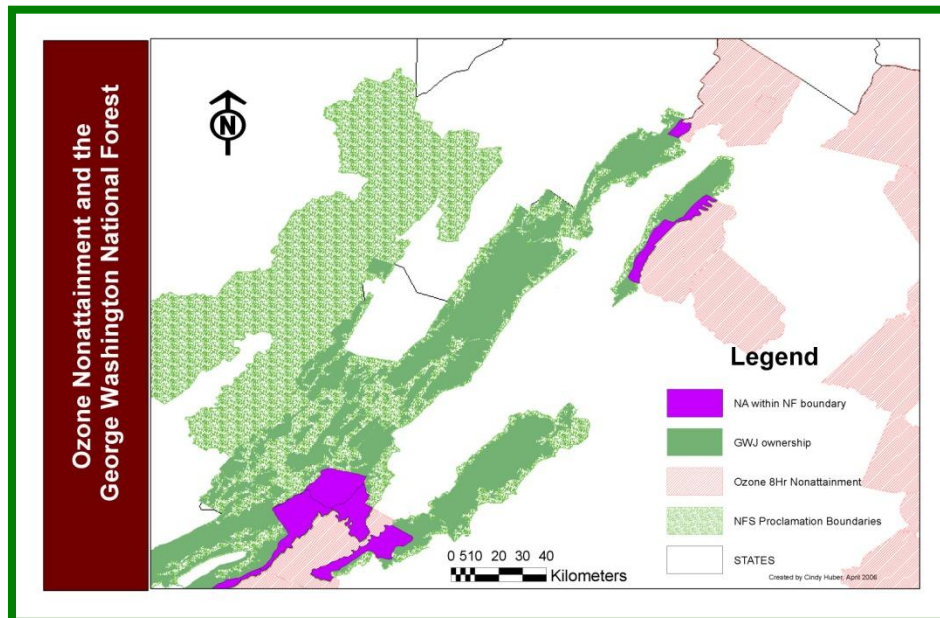
The Plan recognized that regional sources of air pollution outside the control of the Forest, such as acid deposition, were affecting forest resources. The Plan outlined a process for determining air pollution effects to resources and transmitting those to the appropriate air regulatory agencies for consideration as air quality policies and regulations are developed.

The Plan also recognized that State air quality laws become the boundaries for Federal actions, and that all activities, including permitted activities, must be conducted in a manner compliant with the State Implementation Plan.

2. Where is the Plan Now?

The Forest, with the help of partners, is working well with state and federal agencies charged with environmental protection (VDEQ, EPA) to incorporate information on air

pollution effects into new policies and regulations. These are discussed further under



the resource sustainability issues of water quality and soil productivity.

Since the Plan was written, new air quality policies and regulations have been promulgated that could affect forest management. EPA has promulgated the Regional Haze

Rule, issued an Air Quality Policy on Wildland and Prescribed Fire, and designated new ozone and fine particulate nonattainment areas. These actions have implications for fire management on the Forest.

The new Wildland Fire Air Quality Policy increases the need for rigorous smoke management and consideration of alternative fuel treatments. The Regional Haze Rule has resulted in scrutiny of all emission sources that could contribute to visibility impairment, including wildland fire. And where nonattainment areas coincide with national forest land, forest activities are subject to the general conformity regulations of the Clean Air Act. The General Conformity Rule states that federally funded actions must conform to state air quality laws and especially not impede the state's progress toward attainment of National Ambient Air Quality Standards. This means the Forest must make a conformity determination prior to implementing projects that fall within areas designated as nonattainment (not attaining the national ambient air quality standards) or maintenance (previous nonattainment areas). The Forest, working with the Regional Planning Organization VISTAS, has improved current and predicted future wildland fire emissions estimates in state inventories used to develop strategies for improving visibility in Class I areas as well as attainment of national ambient air quality standards. This is important and beneficial for the fire management program, because it will make future conformity determinations simpler. The conformity determination will still require additional time and effort during project planning. Under the current designations, this directly affects the Lee District.

3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes.

b. Why? Minor changes to the existing standards are warranted to clarify Forest Service actions under the current and projected air quality situation and regulations. Air quality standards are becoming more stringent. At the same time, the Forest is increasing the use of fire as a management tool. It is important that the Plan is clear in how the Forest will manage smoke as air regulations change.

c. Tentative Options or Proposed Actions for Change

C-1. Modify the Forest Plan by:

- a) Making administrative changes to some existing standards and eliminate those that are already addressed in laws, regulations, or policy.
- b) Adopting as standards and guidelines the following Jefferson Plan standards:
 1. Adopt Jefferson Plan Standard FW-142 that states: "Best available smoke management practices should be used to minimize the unfavorable effects on public health, public safety and visibility in Class I areas (James River Face Wilderness and Shenandoah National Park) from prescribed fire. (*FSM 5144 and Region 8 Supplement*)"
 2. Adopt Jefferson Plan Standard FW-143 that states: "Prescribed burning should be conducted only when meteorological conditions indicate that smoke can be carried away from non-attainment areas with a forecasted Air Quality Index (AQI) of Code Orange or higher. Prescribed burning should not be conducted in any area that is forecasted with an AQI of Code Red or higher."

C-2. Do nothing.

5. What are the Consequences of Not Changing?

There will be a lack of clarity in the air quality section of the Plan.

Proposed Action

Propose Option C1.

6. Recommendations for Plan Revision

Include the standards and guidelines as described above.

1. Groundwater, Caves and Karst

1. What was the Plan Striving For?

The Forest Plan addresses groundwater through its discussion of water quality. The Forest Plan strove to recognize the importance of producing abundant clean water for the uses on the Forest and of responding to the increasing public and resource needs in watersheds draining from the Forest. The Forest Plan emphasized maintaining or improving water quality to meet demands for beneficial uses of water, both within and adjacent to the National Forest. Furthermore, in any project, water quality was to be protected from nonpoint source pollution through the use of standards and guidelines that met or exceeded best management practices. (Forest Plan, page 2-31).

Forestwide standard # 124 states that “Aquifers and public water sources are identified and protected by consulting with States to ensure compliance with their ground water protection strategies.” This standard is applied when herbicides are being contemplated. Additional information is in the Water Quality section of the report.

Groundwater aquifers most susceptible to contamination from human sources are limestone and dolomite (carbonate geologic formations). Over geologic time, limestone and dolomite dissolve in surface and ground water, and often develop karst terrain characterized by sinkholes, caves, underground drainage, and sinking streams. In karst terrain, surface waters can sink rapidly into the underground and enter the ground water with little or no filtering.

2. Where is the Plan Now?

The recognition of these resources has increased as part of Plan implementation.

The Forest Plan did not provide standards specific to sinkholes or other karst features. Karst areas on the Forest are limited, but interesting geologic features. Since approval of the Forest Plan in 1993, the sinkhole activity at the Trout Pond Recreation Area in West Virginia has been very active, particularly during and after intense rainstorms. The sinkhole activity affects recreation activities and infrastructure.

Likewise, drinking water from springs, wells and bottled water is a groundwater use on the Forest. A few special uses extract water for commercial and residential use.

Some karst areas, such as Maple flats, were protected as Special Interest Areas – Biologic in the Forest Plan. See the Plan's Management Area 4 discussion (Plan pages 3-4 to 3-8.)

Limestone geology is known for its karst features. Many Virginia counties are concerned about groundwater, particularly in karst topography. Counties are attempting to avoid, regulate, or discourage development within areas characterized by karst topography so as to minimize groundwater pollution, thereby protecting long term groundwater quality.

An increase in development and groundwater use near the Forest is a potential impact to karst and groundwater. Interbasin transfer of surface water and groundwater on private land is another emerging situation with potential to affect the Forest.

Geological inventories conducted for existing or proposed management activities help to identify and protect karst and groundwater.

3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes. Water quality and riparian area standards have protected groundwater. The Water Quality section of the report discusses monitoring that shows water quality of stream flow has been protected. Stream flow is predominantly fed by groundwater flow. Thus the monitoring that shows stream water quality has been protected also indicates groundwater quality has been protected. Four caves were gated to protect karst resources. On the other hand, it has been difficult to keep ATV use out of sinkholes in the Maple Flats area.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? In 2006 the Forest Service Washington Office established direction for ground water resource management, with an objective (FSM 2882.02) to: Protect, manage, and improve ground water and ground-water dependent ecosystems, recognizing their unique values, while implementing land management activities. New agency direction is also provided for caves and karst resources, including direction for inventory and analysis. This new direction and emphasis on groundwater and its dependent ecosystems, and on caves and karst, did not exist in 1993 when the GWNF Forest Plan was first revised.

Ground Water-dependent Ecosystems (GDEs) are communities of plants, animals, and other organisms whose extent and life processes are dependent on access to or discharge of ground water.

- Springs, seeps and wetlands
- Ground water-fed streams/lakes and associated riparian areas
- Shallow water table areas
- Cave and karst systems

c. Tentative Options or Proposed Actions for Change

- C-1. Develop Desired Conditions for groundwater and karst
- C-2. Develop Standards and guidelines for groundwater and karst
- C-3. Modify the Forest Plan by rewording GW forestwide standard #15 to a forestwide standard that says "Significant and potentially significant caves on the Forest are managed in accordance with the Cave Resources Protection Act of 1988 (16 U.S.C. 4301-4309) to protect them through regulating their use, requiring permits for removal of their resources, and prohibiting destructive acts. Caves entrances are natural or naturally appearing".
- C-4. Do Nothing.

5. What are the Consequences of Not Changing?

See also discussion in Water Quality section. Groundwater and karst areas would continue to be identified as appropriate and protected as necessary by following the riparian and water quality direction in the Forest Plan, however the 2006 WO direction for groundwater management may receive less emphasis due to lack of visibility in the Plan.

Proposed Action

Propose Option C1, C2, and C3.

Additional Information

The Virginia Department of Conservation and Recreation Natural Heritage Program has identified 19 cave conservation sites on the Forest.

Two of these sites are within Special Biological Areas, two are within Indiana bat protection areas and one is in wilderness. All of these areas need to be part of the desired conditions to protect karst areas and need guidelines to assure protection of the groundwater, karst and cave attributes of the areas.

6. Recommendations for Plan Revision

Include desired conditions and standards and guidelines to protect karst areas and caves including the areas identified by the Commonwealth of Virginia.

J. Geologic Hazards

1. What was the Plan Striving For?

The 1993 Forest Plan provided direction for only one geologic hazard: flooding. Forest-wide Standards 189-194 (page 3-143, 3-144) require identification of flood hazards areas and use of this hazard information in the siting and design of management activities, including facilities and land exchanges/acquisitions.

2. Where is the Plan Now?

In regard to geologic hazards, the Forest Plan remains the same as in 1993 and provides direction for only one geologic hazard: flooding. The Forest Plan includes direction regarding “erosion” but it is focused on water quality (page 2-31) and Forest-wide Standard 199 (3-144)].

3. Did Management Activities Move the Forest towards the Desired Future condition?

Not completely because only flooding was considered as a geologic hazard at that time. The Forest Plan does not provide specific direction on landslides, which are often catastrophic events with major effects on ecosystems, riparian areas, aquatic habitat, soils, flooding, infrastructure, and public safety on and off the Forest.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? Geologic hazards on the National Forests affect public safety and property on the Forest and off the Forest in adjacent communities (Collins, T.K. July/August 2005. [Geologic Hazards on National Forests. Geo-Strata](#). p31-34). The Nation-wide trend of more people building homes and communities next to the National Forest creates an emerging issue for affected Forests like the George Washington National Forest. The increase in population and infrastructure next to the Forest increases the risks to public safety from geologic hazards associated with the Forest and with adjacent private land. This is an emerging issue.

The Forest Plan provided direction for flooding but not for other geologic hazards that are present on the George Washington National Forest and that may affect or be affected by management activities. These geologic hazards include:

1. Landslides (including debris slides/debris flows, rockfalls, rockslides, road cut-slope and/or fill slope failures, log landing failures).
2. Sinkholes (karst hazards including ground collapse and ground water pollution).
3. Abandoned mines (including physical hazards and ground collapse).
4. Debris floods.
5. Failure of temporary dams created by landslides or debris floods.
6. Alluvial fan hazards.

Geologic hazards are geologic processes or conditions (naturally occurring or altered by humans) that present a risk or potential danger to life and property. Geologic hazards

may affect or be affected by Forest management activities. For example, landslides are geologic hazards. Natural landslides can damage or destroy Forest Service facilities, and injure or kill Forest visitors and employees. Different geologic settings have different geologic hazards. If siting, design, and maintenance of Forest management activities does not consider the geologic setting and potential geologic hazards, then the public investment, public infrastructure, and public safety may be inadvertently and unnecessarily put at risk.

In addition to natural landslides, some landslides are caused or influenced by human activities. For example, excavation for road construction on a steep slope can undercut and remove some support from the hillside. In some geologic settings (adverse bedrock structures or weak surficial materials), this undercut and removal of support may lead to failure of the road cut-slope. Again, if siting, design, and maintenance of Forest management activities does not consider the geologic setting and potential geologic hazards, then the public investment, public infrastructure, and public safety may be inadvertently and unnecessarily put at risk.

The following are some examples of geologic hazards that suggest the need to add direction on geologic hazards in the Revised Plan.

1. Landslides

The June 27, 1995 rain storm triggered more than 40 landslides on the Pedlar Ranger District between Buena Vista and Glasgow on the Westside of the Blue Ridge. These landslides were a particularly dangerous type of landslide, called a “debris flow”. These debris flows typically originate high on a mountainside as a debris slide that gouges down the mountainside (scraping off the soil and trees) and snowballs into a much larger landslide; as this mass sweeps downslope it transforms into a highly destructive debris flow that can travel hundreds or thousands of feet downslope and downstream from its source area. These June 27, 1995 landslides originated on the steep slopes of the National Forest, swept down Belle Cove and other drainages, and discharged destructive “debris flows” onto private lands and various roads, including State Highway 501.

The June 27, 1995 rain storm also illustrates another key point: storm damage attributed to “flooding” is sometimes due to “landslides”, particularly debris flows. Research in the Appalachian region (Jacobson et al. 1989) indicates that the most catastrophic of geomorphic events will be “those in which conditions simultaneously promote landslides and high flood discharges.” (Jacobson, R.B., A.J. Miller, and J.A., Smith. 1989. The role of catastrophic geomorphic events in central Appalachian landscape evolution. *Geomorphology* 2:257-284.)

The June 27, 1995 rain storm triggered similar debris flows in the Shenandoah National Park and private lands on the eastside of the Blue Ridge in Madison County, Virginia. The U.S. Geologic Survey (USGS) conducted field investigations and produced a series of scientific reports to understand the conditions that cause debris flows and to suggest methods to mitigate future events. For example, one of the USGS reports states: “Zoning and grading ordinances to avoid building in areas of potential hazard or to regulate construction to minimize potential for landsliding is one non-structural method to reduce the likely consequences of debris flows.”

([“Debris-Flow Hazards in Areas Affected by the June 27, 1995 Storm in Madison County, Virginia”](#), 1997, Morgan, B.A., Wieczorek, G.F., Campbell, R.H., and Gori, P.L., USGS OPEN FILE REPORT 97-438)

The USGS also produced a Fact Sheet (FS 159-96) "[Debris-Flow Hazards in the Blue Ridge of Virginia](#)". The information in the Fact Sheet can help the public and government officials understand and plan for debris flow hazards.

One of the purposes for this major scientific effort by the USGS is to help government officials at all levels (federal, state, and local) in Virginia and other parts of the Appalachians understand the important role that land-use planning can have in avoiding or mitigating landslide hazards. This best available science provides a timely alert for the Plan Revision to consider a need for change: adding Plan direction for landslides and other geologic hazards.

2. Sinkholes

In 1995 the Lee Ranger District asked the Forest geologist to help develop interpretative information for a planned trail near the sinkholes at the highly developed, heavily-used Trout Pond Recreation Area. The Forest geologist examined the sinkholes, found evidence of recent and continuing sinkhole activity (ground collapse, ground settlement), and determined that the sinkholes are a geologic hazard that should be investigated and monitored. In order to provide the Lee RD with more detailed information and hazard assessment to help in management of the Recreation Area, the Forest geologist developed a partnership with the West Virginia Geological and Economic Survey (WVGES). The WVGES mapped the sinkholes, and, in 1997, provided the Lee RD with an assessment of geologic hazards and mitigating measures to consider in management of the Recreation Area.

Since then, Forest Plan monitoring has reported on sinkhole activity at Trout Pond Recreation Area. In 2002 sinkhole activity led to temporary closure order of Trout Pond and the surrounding loop trail. In 2003 a sinkhole opened under a paved road near the entrance hut to Trout Pond Recreation Area; road repair costs were about \$7,000. An examination of the Trout Pond area in April 2006 found new sinkhole activity and substantial expansion that is a potential threat to a power line and access road to the sewage treatment lagoon.

Furthermore, geologic investigations were requested and conducted for the first two sites proposed for a new Lee Ranger District office. These two sites were dropped from further consideration based on non-geologic reasons. A geologic investigation was not requested for the third site. This site was selected as the new office site. A design/build contract was let. During the early stage of the contract in 2005, Forest personnel noticed what appeared to be a sinkhole on the site. The Forest geologist examined the site and determined there was active sinkhole activity on part of the site as well as an older sinkhole in another part of the site. The Forest geologist recommended subsurface investigation of site, and consideration of the sinkholes in the siting and design of the facilities. A subsurface investigation (estimated cost: \$20,000) was conducted, and various siting and design changes were made in the design/build process.

Finally, the NFMA states that the implementing regulations shall "provide for methods to identify special conditions or situations involving hazards to the various resources and their relationship to alternative activities" (16 U.S.C. 1604(g)(2)(C)).

c. Tentative Options or Proposed Actions for Change

C-1. Modify the Forest Plan by:

- a) Modifying to a Desired Condition the intent of Revised Jefferson Forest Plan Goal 31 (page 2-53) that states "Manage geologic resources to provide multiple public benefits. Manage geologic hazards to protect public safety and facilities while integrating the keystone role of these natural disturbances in riparian and watershed management. Integrate geologic components (processes, structures, and materials) in management of riparian areas, watersheds and ecosystems."
- b) Adopting the Revised Jefferson Forest Plan Forest-wide Standard FW-216 (p. 2-53) that states: "Trails, roads, other facilities, and activities should be located and designed to avoid, minimize, or mitigate potential geologic hazards."

C-2. Do Nothing.

5. What are the Consequences of Not Changing?

The consequences of not changing are that:

- 1) The environmental analyses for Forest management activities and infrastructure are not likely to provide Line Officers with the geologic science information needed a) to recognize geologic hazards in projects areas, b) to assess how geologic hazards may affect or be affected by management activities, c) to develop alternatives and mitigating measures based on geologic science to deal with geologic hazards, d) to make informed decisions about geologic hazards that affect public investments, public infrastructure, and public safety.
- 2) The siting, design, and maintenance of Forest management activities and infrastructure are not likely to include the geologic science information needed to identify and manage geologic hazards, thus placing public investment, public infrastructure, and public safety at risks that are foreseeable and preventable.

Proposed Action

Propose Option C1.

6. Recommendations for Plan Revision

Include desired conditions for karst and caves as described.

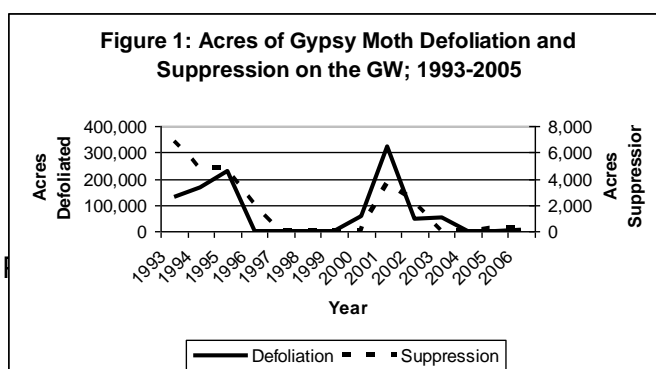
Issue Forest Pests and Invasive Species

A. Population Control

1. What was the Plan Striving For?

The Forest Plan strove to provide a forest environment where damage to natural

resources from forest pest organisms, especially gypsy moth, is minimized when such damage prevents the attainment of other natural resource objectives. The

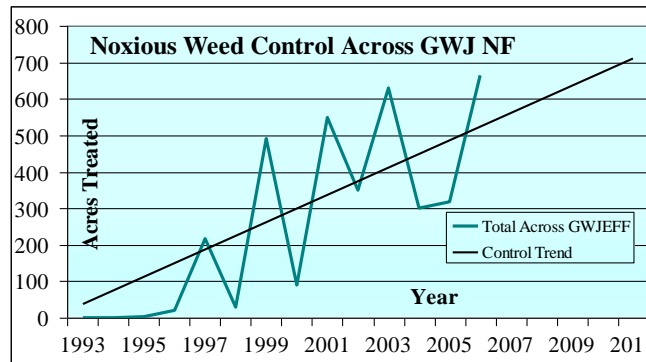


Forest was to manage insect and disease populations by utilizing the principles of integrated pest management.” (Revised Plan, 2-35)

2. Where is the Plan Now?

Figure 1 indicates that trends in gypsy moth population suppression and corresponding trends in gypsy moth defoliation.

The graph at right shows the amount and trend of noxious weed control across both Forests. Data just for the GW is not available.



3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes. Gypsy moth population control responded to increasing populations, focusing on those areas where defoliation impaired other resource objectives; primarily in recreation areas and high value timber stands.

4. Is There a Need for Change?

- Is a Change in the Plan warranted? No
- Why? We are attempting to control populations when and where needed.

B. Intervention Treatments

1. What was the Plan Striving For?

The Forest was to have limited treatments to defoliating populations of gypsy moth be based on sound forest health evaluations. We were to utilize natural enemies where appropriate (Plan pages 2-35 and 2-36).

2. Where is the Plan Now?

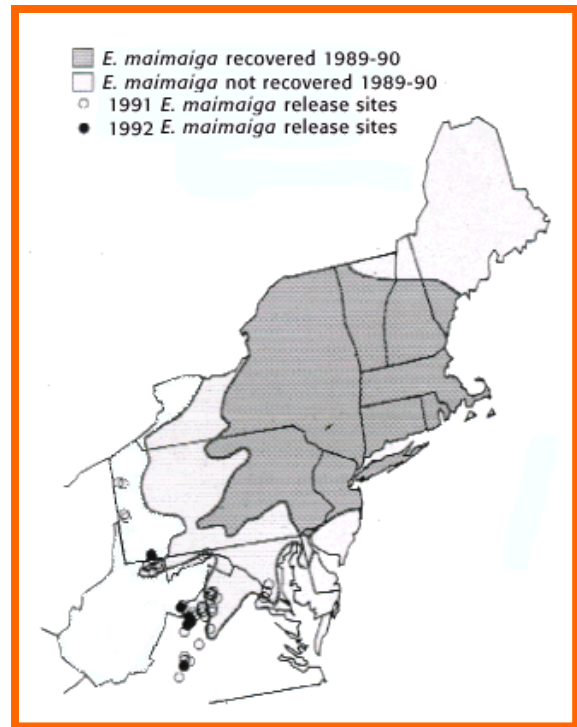
A forest health evaluation was performed, typically by the Southern Research Station, for gypsy moth suppression projects. Suppression efforts have focused on recreation areas, existing timber sales where an investment in management has already been made, or in high value stands where future harvests were planned. Therefore the treatments have been economically justified and the costs and benefits of treatment fully considered. Natural enemies have been utilized. *Bacillus thuringiensis* var. *kurstaki* (Btk), a naturally occurring bacterial pathogen of moths and butterflies, is the primary treatment method for suppression. *Entomophaga maimaiga*, a fungal pathogen, has also been released at selected sites on the Forest.

The figure at right displays release sites of a fungal pathogen of the gypsy moth (Hajek, 1996).

However, the gypsy moth is not the ONLY pest and perhaps not the even the most important at this time. The hemlock woolly adelgid has spread throughout the entire Forest and threatens to seriously impact hemlock forests and some of the riparian values associated with hemlocks. Populations of southern pine beetle have exploded and caused pine mortality in portions of the Forest. The Forest's concern has greatly increased regarding non-native invasive species of all kingdoms (plants and animals) which threaten the integrity of many different ecosystems.



Hemlock Woolly Adelgid (Courtesy: Northeastern Area)



3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes: a forest health evaluation has been performed for gypsy moth suppression projects, thus, cost/benefit analyses have been performed, and we have utilized biological agents in combating the gypsy moth.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? The text in this section is focused on gypsy moth intervention alone. There are a myriad of forest pests that threaten the natural resources. We are currently engaged in intervention treatments for the hemlock woolly adelgid. We have attempted suppression of southern pine beetle outbreaks in the past. Incidence of oak decline is expected to increase as the GWNF forest ages. There certainly could be new pests in the future on the Forest that we are only vaguely aware of existing or pests that we are totally unaware of at this time.

Additionally, NonNative Invasive Species (NNIS) pose a threat to forest health. NNIS have become a focus for the Forest Service since the 1993 Forest Plan. Exotic plants can have serious localized impacts on forestry (SAA, 1996). The Chief of the Forest Service has identified NNIS as a threat to our Forests.

We need to broaden the focus of the Revised Forest Plan to all forest pests, not just the gypsy moth.

c. Tentative Options or Proposed Actions for Change

C-1. Do nothing

C-2. Modify the Forest Plan by:

- a) Making an administrative change to the heading of this issue to read “Forest Pests” and globally, throughout the Plan, substitute “forest pests” for “gypsy moth”.
- b) Establishing a Forestwide Desired Condition that states: “A forest environment is provided where damage to natural resources from forest pests (any non-native invasive species including plants, animals, insects, and/or diseases) are minimized when such damage prevents the attainment of other natural resource objectives.
- c) Establish an Objective for treating NNIS on the GWNF.
- d) Develop a Forest Strategy for managing NNIS. This strategy would address prevention and public education, focus species, inventory protocols, and treatment methods.

5. What are the Consequences of Not Changing?

Generally minor in nature. Common Standards already exist to utilize Integrated Pest Management techniques. A site-specific analysis and decision on a catastrophic non-native invasive plant, animal, insect and/or disease threat might be unnecessarily complicated by a Forest Plan Amendment; resulting in more time and effort.

Proposed Action

Propose Option C2.

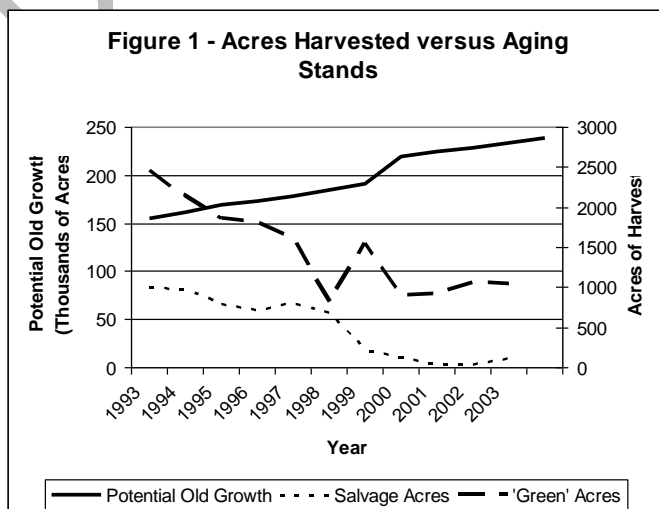
6. Recommendations for Plan Revision

Include the desired condition and expand the program direction to other pests.

C. Silvicultural Practices

1. What was the Plan Striving For?

Silvicultural practices are considered as a means for reducing damage caused by pests.



High gypsy moth mortality stands receive priority on scheduling regeneration harvests.

2. Where is the Plan Now?

Figure 1 indicates that as stands have aged, harvest levels have

declined. Aging stands are more vulnerable to gypsy moth and many other insects and disease.

Conclusion: Harvesting cannot be meaningfully used to reduce vulnerability given present harvesting levels. We may not be prioritizing harvests based on vulnerability but there is not enough data. However, the DFC as stated in the plan is a sound and worthy one. It is the agency's ability to achieve it that is difficult.

3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes, we have moved toward the DFC. But that movement is relatively small in relation to the increasing vulnerability of the Forest.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? Gypsy moth is not the only pest that can be treated silviculturally (Gottschalk 1993, Mason 1989). Southern Pine Beetles are controlled effectively through silviculture (Thatcher 1980; Belanger 1980; Swain 1981; Boyle 2004). Oak decline risk can be reduced through regeneration harvests (Oak 2004 and Oak 1991). The focus needs to be on any and all forest pests as appropriate; not just gypsy moth.

c. Tentative Options or Proposed Actions for Change

C-1. Do nothing.

C-2. Make administrative corrections by broadening titles and appropriated standards and guidelines that refer only to gypsy moth to refer to pests and diseases.

5. What are the Consequences of Not Changing?

There would be little consequences to the plan. Common Standards on pages 3-130-133 provide a "blanket" IPM standard which includes silvicultural treatments. There could be continued difficulty in forming a strong P&N as guided by Forest Plan DFC's, especially with regards to oak decline and perhaps any future unknown forest pests. Difficulty in responding to expected increase in oak decline incidence due to lack of DFC related to harvesting and forest pests. Response to a truly catastrophic insect and disease threat might be unnecessarily complicated by a Forest Plan Amendment; resulting in more time and effort.

Proposed Action

Propose Option C2.

6. Recommendations for Plan Revision

Expand the program direction to other pests.

D. Non-Native Invasive Plants

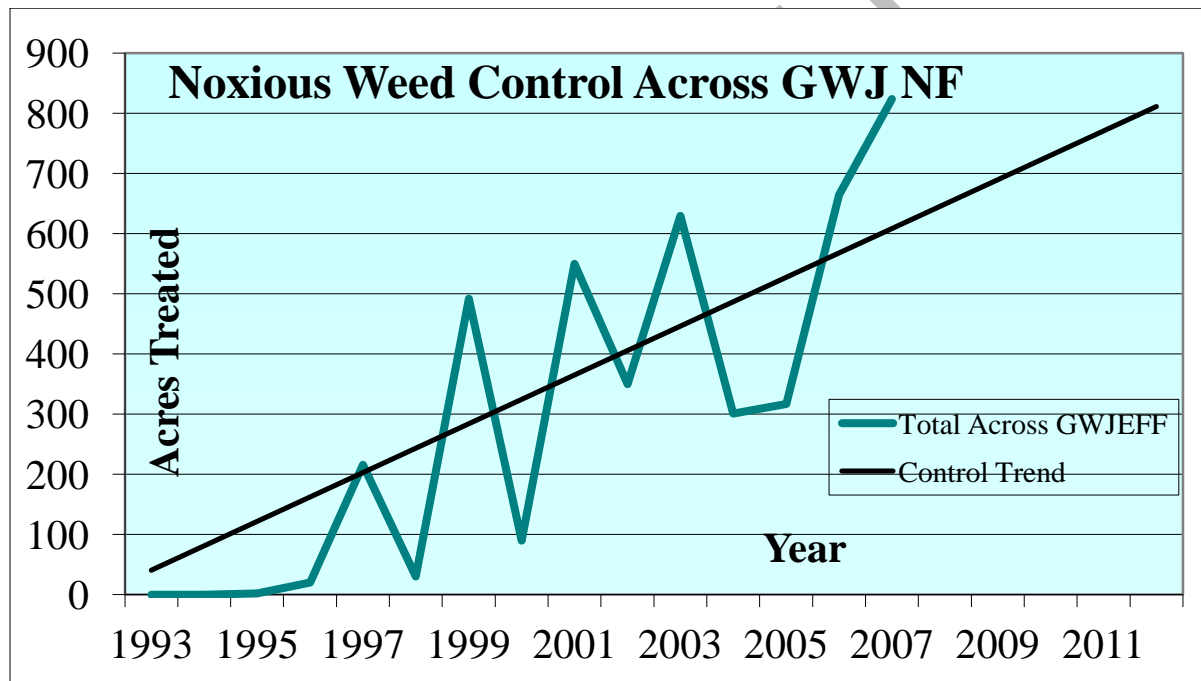
Plants that are not native to the Forest's ecosystems and are likely to cause economic or environmental harm are considered to be non-native invasive species. The introduction and spread of these species has been a growing concern by the public and by the Forest Service. The main species currently of concern on the Forest include: Tree of Heaven

Ailanthus altissima, Multiflora rose *Rosa multiflora*, Autumn olive *Elaeagnus umbellata*, Kudzu *Pueraria Montana*, Mile-a-minute *Polygonum perfoliatum*, and Garlic mustard *Alliaria petiolata*. Others include: Empress or princess tree *Paulownia tomentosa*, Bicolor lespedeza *Lespedeza bicolor*, Japanese privet *Ligustrum japonicum*, Chinese privet *Ligustrum sinense*, Common privet *Ligustrum vulgare*, Oriental bittersweet *Celastrus orbiculatus*, Japanese grass or stiltgrass *Microstegium vimineum*, Tall fescue *Fescue elatior*, Japanese knotweed *Polygonum cuspidatum*, Purple loosestrife *Lythrum salicaria*, Sericea or Chinese lespedeza *Lespedeza cuneat*, and Spotted knapweed *Centaurea maculosa*.

Trends in non-native invasive species include:

Treatment of “noxious weeds” had historically been focused on grazing allotments and hay fields. Since 1998 treatment has expanded to roadsides, wildlife openings, timber harvest areas and other occurrences around the Forest.

Chart of acres treated



The Forest has begun inventory and monitoring of populations of non-native invasive species, but this effort is still in the early stages of implementation.

Recommendations for Plan Revision

Include desired conditions to reflect the desire to have ecosystems without non-native invasive plants and include guidelines and strategies to prevent and control the spread of non-native invasive species.

CHAPTER 4. SOCIAL AND ECONOMIC CONDITIONS AND TRENDS

Introduction

The 1993 Revision of the GW Plan focused on a number of significant issues. These issues were developed through an extensive public involvement effort. The issues were used to 1) develop the environmental analysis; 2) evaluate the alternatives considered; and 3) help define the desired condition of the Forest. Due to the importance of the issues in defining the current George Washington Forest Plan, the issues were used as a starting point to evaluate how well the plan has been implemented and where changes may be needed. New issues, information from our public collaborative efforts and additional analysis of science were used to refine and expand the issues.

Issue Timber Program

A. Efficiency of Timber Sale Program

The below cost issue centered on concerns that the cost of the Forest's timber management program was greater than the revenues generated from the sale of timber. At the time of the Plan revision, the Forest Service was working through a number of ways to calculate the cost and benefits from the timber sale program. The Timber Sale Program Information Reporting System (TSPIRS) was used for several years. The magnitude of this issue diminished sharply through the years. The timber program on this Forest is used as one of the primary tools to manage wildlife habitat. The achievement of the wildlife habitat goals along with the benefits of producing timber from the Forest has program costs. While the sale of timber offsets some of these costs, it does not generally offset all of the costs. It is not a goal of the Forest that this revenue offset the total costs. The overall benefits in wildlife management, forest health and timber production require the expenditure of funds just as the management of other resources like recreation and watershed.

Since TSPIRS was abandoned we have no longer specifically tracked the costs and benefits of the timber management program in a formal manner. The following chart identifies the costs and revenues of the Forest's revenue generating programs over the past 15 years:

Annual Expenditure and Revenues for George Washington and Jefferson National Forests

	1993	1994	1995	1996*	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
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Annual Expenditures (Thousand dollars)

Recreation	\$3,012	\$1,887	\$2,096	\$3,583	\$4,885	\$4,392	\$4,577	\$5,336	\$5,573	\$4,987	\$3,406	\$4,780	\$3,730	\$4,029	\$4,327
Range	\$19	\$23	\$10	\$111	\$248	\$165	\$186	\$56	\$75	\$56	\$43	\$74	\$52	\$45	\$41
Timber	\$2,003	\$1,291	\$1,482	\$2,816	\$2,866	\$2,434	\$3,858	\$3,429	\$3,419	\$3,253	\$2,330	\$3,481	\$1,691	\$1,575	\$1,672
Minerals	\$72	\$36	\$32	\$159	\$141	\$150	\$359	\$331	\$467	\$581	\$425	\$653	\$475	\$385	\$379
Lands	\$801	\$570	\$419	\$1,177	\$817	\$864	\$989	\$980	\$978	\$849	\$992	\$1,062	\$510	\$611	\$572

Annual Revenue (Thousand dollars)

Recreation	\$327	\$270	\$298	\$319	\$444	\$219	\$124	\$7		\$18	\$17	\$22	\$9	\$0	\$0
Range	\$0	\$8	\$4	\$5	\$19	\$20	\$3	\$0		\$17	\$15	\$21	\$9	\$5	\$5
Timber	\$1,292	\$2,112	\$2,275	\$1,838	\$2,832	\$2,980	\$1,493	\$1,193		\$1,390	\$1,247	\$1,618	\$1,971	\$1,191	\$1,581
Minerals	\$1	\$1	\$1	\$1	\$3	\$3	\$2	\$2		\$3	\$3	\$3	\$3	\$3	\$4
Lands	\$53	\$55	\$73	\$56	\$107	\$112	\$63	\$58		\$128	\$123	\$135	\$148	\$137	\$115

Revenue as % of Expenditure

Recreation	11%	14%	14%	9%	9%	5%	3%	0%		0%	0%	0%	0%	0%	0%
Range	0%	32%	41%	4%	8%	12%	2%	0%		31%	35%	28%	18%	12%	11%
Timber	64%	164%	153%	65%	99%	122%	39%	35%		43%	54%	46%	117%	76%	95%
Minerals	2%	3%	4%	1%	2%	2%	1%	1%		1%	1%	0%	1%	1%	1%
Lands	7%	10%	17%	5%	13%	13%	6%	6%		15%	12%	13%	29%	22%	20%

*Combined Forests in 1996

B. Rural Development

1. What was the Plan Striving For?

The 1993 George Washington National Forest Plan continued the Forest contributions to the economic and social vitality of its neighbors (Plan page 2-13). The Forest was to work with neighboring people and communities in developing natural-resource-based opportunities and enterprises within the capabilities of the resource. Rural Development considerations were to be included in Forest decisions to assist communities in achieving long-term economic development. The Forest was to actively seek partnerships that promote development activities (Plan page 2-3).

The 1993 Forest Plan did not address or focus on bio-fuels. The economic and social conditions have changed with respect to energy. There is a national desire to move toward energy independence which includes many sources of energy, including bio-fuels.

2. Where is the Plan Now?

See economic and social sustainability analysis in an appendix to this report.

3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes, insofar as those conditions were described.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes. In terms of the Rural Development as discussed in the current plan, we are just changing the focus.

b. Why? Rural Development was a focus item for the Agency with the implementation of the 1990 Farm Bill and grants associated with it to communities. The grants focused communities to find alternative ways to sustain their economies and to become less natural-resource dependent. This program has ceased.

The current focus for the Agency in relationship to communities is on developing partnerships. There is a national partnership taskforce and legislation has been written to assist the Forest Service in managing partnerships more efficiently. The partnership program provides the framework for the Forest Service to work with communities on projects that jointly benefit both entities separate from direction in a Forest Plan. This partnership direction is currently in place and does not need to be in the Forest Plan.

In terms of bio-fuels we believe we need to include a Desired Condition as it relates to bio-fuels which may include biomass for burning to generate power and/or heat, biomass for the distillation of various combustible compounds, or any as yet unknown technology whereby biomass can be utilized to create an energy source.

C. Tentative Options for Proposed Actions or Change:

C-1 Develop a forestwide Desired Condition statement such as: The Forest contributes to the production of desired social and economic goods and services. People depend on the GWNF directly and indirectly to provide goods and services generated by natural, built, and human capital. These goods and services are provided

in many forms. In the vegetation arena they may include timber of a range of qualities from low quality tie logs and posts to high quality furniture and flooring, pulpwood for all grades of paper manufacturing, fuel ranging from firewood for the individual household to large scale biomass fuels. The forest also provides mineral related goods and services which may range from oil and gas leasing to small scale hardrock permits for gathering building materials. The forest provides services related to myriad forms of recreation and tourism that range from dispersed recreation activities such as driving, hiking, birding, horse-back riding, hunting and fishing, to developed recreation facilities and these services provide secondary economic benefits to local communities. A sufficient mix of resource uses to meet the demand for most users is provided

The Forest produces renewable goods and services as a sustainable flow within the regenerative capabilities of the ecosystem. The flow of wood-products in general has been decreasing since 1993 from about 30 MMBF to 12 MMBF and is far below the long term sustained yield. Many members of local communities have expressed a desire that the forest provide more wood products than has occurred in recent history, while others believe the Forest should refrain from providing wood products and focus on goods and service not provided on private lands such as recreation and tourism. In the spirit of multiple-use and balancing the “sufficient mix” of the demands for goods and services, the forest may produce from 20 to 30 MMBF of wood products and still allow for ample supply of the minerals, recreation, and tourism related goods and services.

C. Suitability (Review)

See Discussion in Appendix D. In summary, Forest Plan Appendix A defines “Lands Blocked by Physical Barriers” as “...lands which cannot be logged even with cable logging equipment. Timber harvest and access are blocked by rock ledges, cliffs and other physical barriers.” Based on a literal interpretation of the NFMA Regulations, these lands were eliminated from suitability in 1993 (within the category “Irreversible Damage Likely to Occur” when they should not have been because technology existed then in the form of helicopters to successfully manage timber. (1993 Process Paper first identified this error).



Therefore, in this current suitability analysis, these lands have been identified as being in the standard forest land base. Given that the Forest has utilized helicopter logging successfully since 1993, the timber inventory data was reviewed and corrected where high site index stands (Site Index greater than or equal to 70) had previously been identified as inaccessible due to physical barriers, such as rock outcrops are in the way to getting to that stand with a road (Land Class Code = 826) as now being accessible for helicopter logging. High site index was chosen because of the economic value of the timber (high sites = better

timber) would justify the expense of helicopter logging. Therefore, they were coded as standard forest land on steep slopes (Land Class Code = 540).

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes. Lands suitable for timber production may change due to improved technology or due to changes in how the new planning regulations address lands across the Forest, or in how desired conditions might change.

b. Why? The current planning regulations recognize two categories of suitable uses as it relates to timber; suitable for timber production and suitable for timber harvest. It is envisioned at this time that a majority of the acres currently identified as suitable for timber production will become lands suitable for timber harvest in the Revised Forest Plan under the current planning regulations (e.g. those suitable lands in current MA's 14, 15, and 16). As described above, some lands were erroneously identified as unsuitable for timber production in 1993 due to a lack of access and those lands should now be considered for suitability of timber production or harvest. Finally, changes in other allocations (e.g. recommended wilderness areas or Special Biological Areas) may reduce the acres suitable for timber management. However, we caution that loss of land regulated for sustained timber production and/or harvest reduces the areas where timber harvest can be used as a tool to meet wildlife habitat needs efficiently. It also reduces Long-term Sustained Yield and yearly ability to produce timber.

c. Tentative Options or Proposed Actions for Change

C-1. a) Strive to maintain at least the existing amount of forest suitable for timber production or suitable for timber harvest between 350,000 to 370,000 acres so as to maintain some capability to meet wildlife habitat, forest health, and the economic status of local community needs.

b) Identify all of those NFS lands currently within MA 17 (Timber Production) but outside of any other special areas and otherwise consistent with timber suitability requirements as Suitable for Timber Production.

c) Identify all of those NFS lands currently within other MA's but outside of any other special areas and otherwise consistent with timber suitability requirements as Suitable for Timber Harvest.

C-2. Do Nothing.

Proposed Action

Propose Option C1.

5. Recommendations for Plan Revision

Areas identified as suitable for timber production are not all available for harvest. When site specific analysis is done for a project, many factors are evaluated and many areas are found to be unavailable either permanently or for the current proposal. These factors include topography, riparian protection areas, visual concerns, wildlife needs,

current markets for the product and activities on nearby lands. Based on past efforts at assembling project proposals, the acres of forest suitable for timber production should be similar to the acres that have been available under the current plan. This should allow for the needed flexibility to implement the plan and achieve the wildlife and timber objectives of the revised Plan.

D. Allowable Sale Quantity

1. What was the Plan Striving For?

The GW 1993 Revised Plan contained an objective to achieve an allowable sale quantity (ASQ) of 330 million board feet (mmbf) for the first decade (Revised Plan, page 2-15). In essence, the Forest wished to offer or sell an average of about 33 mmbf of timber per year. The ASQ is an estimate of the quantity of timber that may be sold from the area of suitable land covered by the forest plan for a time period specified by the plan (36 CFR 219.3 and FSM 1900, prior to amendment). ASQ is closely related to Long Term Sustained Yield (LTSY), described below and can be thought of as a “ceiling” for timber production (Brown 1993) This ASQ was consistent with achieving an amount of vegetation manipulation to achieve wildlife and other multiple-use objectives. The 2006 planning directives changed the term ASQ to “Timber Sale Program Quantity” (TSPQ).

Likewise, the GW 1993 Revised Plan provided an estimate of the Long-term sustained yield of timber that could be removed annually in perpetuity on a sustained yield basis from lands suitable for timber production once the forest was entirely regulated. LTSY was estimated at 93 mmbf annually for the GW 1993 Revised Plan.

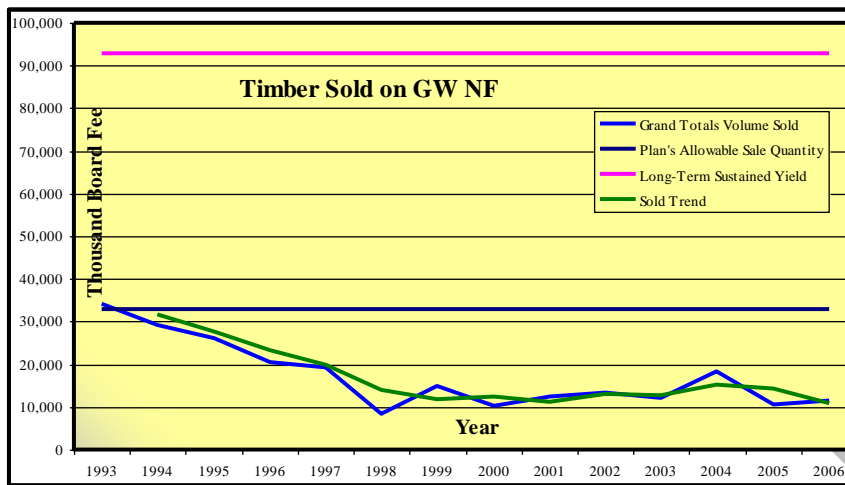
The 1993 Revised Plan also allowed for a combination of even-aged and uneven-aged regeneration harvest methods (Revised Plan page 2-27 and 2-28). Under all even-aged methods, about 2,300 acres were to be treated annually (Revised Plan FEIS, page 3-119 for alternative 8A). Uneven-aged harvest was to occur on about 800 acres annually or 80 acres annually of actual group selection with intermediate thinnings in between the groups across the rest of the acres.

Modified shelterwood harvest was to be the primary even-aged timber harvest method employed and was to have occurred on about 1,600 acres annually. Clearcutting was to be used only after site-specific, project-level analysis determined that other regeneration harvest methods would not achieve the desired future condition of the management area. The clearcutting objective in the 1993 Plan was for about 300 acres annually. For instance, (1) Clearcutting would be the only method that would be reasonable following wildfire damage; or (2) clearcutting could be the only method that can achieve the desired wildlife habitat conditions for a particular species (such as grouse) that requires high stem density (Revised Plan page 2-27 and 2-28).

All vegetation management, including timber harvesting, was to be accomplished in a manner that maintains the diversity, productivity, and long-term sustainability of ecosystems.

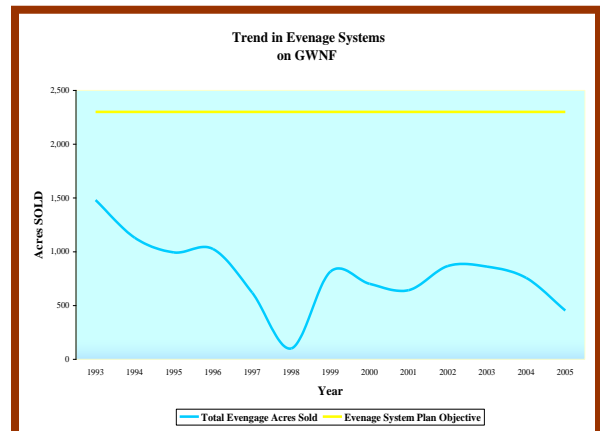
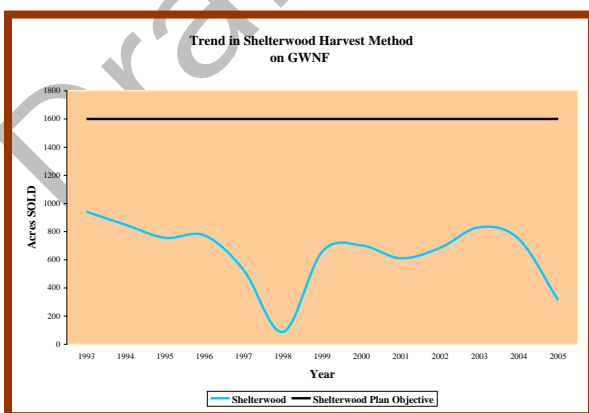
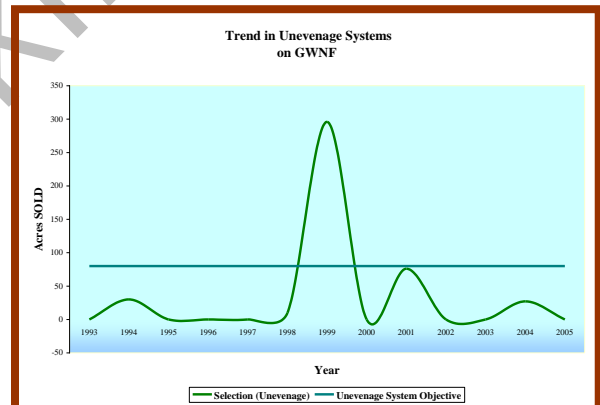
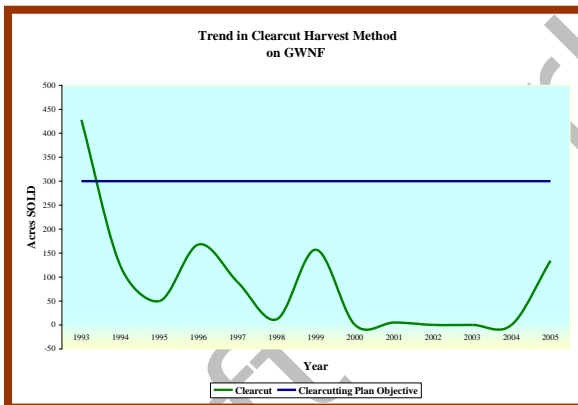
2. Where is the Plan Now?

The following graph shows the trend in volume sold since 1993 compared to the average annual ASQ of the 1993 Forest Plan. Long-Term Sustained Yield (LTSY) volume is also



displayed for the 1993 Forest Plan. Sold volumes have dropped well below the ASQ. Volume sold has trended downward since 1993. The average volume sold since 1993 has been about 16.3 mmbf, about half of the desired ASQ and less than 20% of the LTSY.

The following graphs present the trends in the type of silvicultural systems that were accomplished versus the Plan objectives. The acreages shown in these graphs represent what was sold through commercial timber sales.



3. Did Management Activities Move the Forest towards the Desired Future condition?

Management activities did not move towards maintenance of diversity of wildlife and/or wildlife habitat. Early seral habitat as created by commercial timber harvest decreased both in terms of acres harvested and failure to achieve the ASQ. Meanwhile, forests continue to age and provide an abundance of late seral stage habitat.

Sustainability and productivity were maintained as management activities have averaged less than 20% of the LTSY.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? We will need to reevaluate within the context of changes made in the desired condition, objectives and standards of the revised Plan.

c. Tentative Options or Proposed Actions for Change

C-1. Modify the Forest Plan by updating the analysis.

C-2. Do Nothing.

5. What are the Consequences of Not Changing?

We would not be addressing plan requirements.

Proposed Action

Propose Option C1.

6. Recommendations for Plan Revision

Complete the required analyses.

E. Salvage

1. What was the Plan Striving For?

The Plan strove to provide a forest environment where the ecological processes of the forest were balanced against social and economic uses (Rose 2001). It recognized that dying, dead and damaged trees were an important part of the ecosystems of the Forest and did not permit salvage harvesting in certain areas. Correspondingly, it also recognized that after an event such as that associated with insects or disease, dying, dead, and damaged trees were also a resource that can be used for fuelwood by the public or sawtimber if removed prior to deterioration (Plan pages 2-15 and 2-16).

2. Where is the Plan Now?

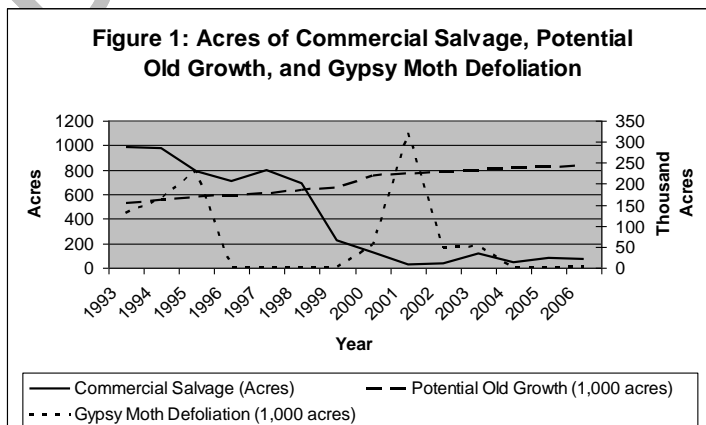


Figure 1 shows the trend in commercial salvage. Note that for the years of 1993 – 2001 volumes were converted from Thousand Board Feet to Hundred Cubic Feet using the Regional Conversion factor of 1.82 MBF per CCF.

The data suggests that: acres treated by commercial salvage sales have declined significantly despite an aging forest, two separate gypsy moth events, and projected increases in oak decline impacts. (Figure 1 and SAA, 1996) It is strongly indicated that in most cases high-value products are not salvaged before that value is lost. It also suggests that commercial salvage was not strongly tied to gypsy moth damage during the population explosion in the early part of this century (Figure 1).

Figure 2 displays estimation from a Forest Vegetation Simulator computer program using the Oak Decline Event Monitor and all Forest Inventory and Analysis 1992 Re-measurements on the George Washington National Forest. This shows that as the forest continues to age we can expect increasing mortality, especially as a result of oak decline (Oak 1991, Oak 2004).

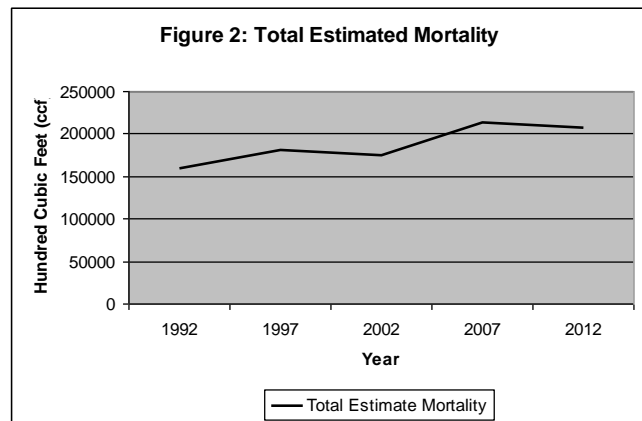
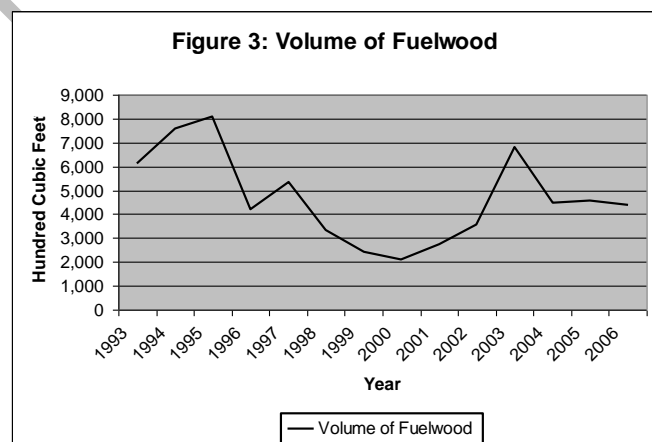


Figure 3 shows that although fuelwood uses have fluctuated, recent trends indicate increasing fuelwood use since 2000.



3. Did Management Activities Move the Forest towards the Desired Future condition?

No. We believe there is no readily apparent “balance” between ecological processes and social and economic uses related to the commercial salvage program. Mortality has increased from 1992 to 2001 and is expected to increase in the future (Rose 2001, Oak et al. 2004). Acres treated by commercial salvage sales have declined precipitously despite an aging forest, two separate gypsy moth events, and projected increases in oak decline impacts. The commercial salvage program does not appear to be balancing

ecological processes with social and economic benefits, since high value products may not be salvaged prior to loss of value in those areas where salvage is permissible.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? Increasing acres of mature and over-mature forests will result in increased incidence of oak decline (Figure 2 Oak 1991; Oak et al., 2004; SAA, 1996). The occurrence of gypsy moth is also expected to increase the incidence of oak decline. Heavy oak mortality has occurred over large areas of the Southern Appalachians. Major losses will probably be most common on national forests and in Virginia (SAA, 1996). The same condition results in increased vulnerability/susceptibility to many other insects and diseases such as red oak borer and gypsy moth. There is a need to revise certain guidelines to allow increased flexibility in utilizing salvage to achieve the stated desired condition.

c. Tentative Options or Proposed Actions for Change

C-1. Modify the Forest Plan by revising or adding standards and guidelines similar to the following to appropriate forest or special area direction:

- Special Biological Area (Old GW MA 4-58): Where salvage would maintain or enhance the unique attributes of a specific Special Biological Area as determined on a case by case basis, the following activities could occur. Ground-based systems could be used for the salvage of dead, dying, or damaged trees along open road systems. For that part of the area not accessible by existing roads, salvage activities should only be accomplished by helicopter with no new road or landing construction.
- Scenic Corridor or Viewshed (Old GW MA 7-14): Salvage of dead, dying and damaged trees can occur to provide for scenic rehabilitation and public safety using ground based or helicopter logging.
- Remote Backcountry Area (Old GW MA 9-12): Where salvage would not significantly impair the remote experience, salvage of dead, dying, or damaged trees can occur from perimeter roads using helicopter logging with no new permanent or temporary road or landing construction within the area. Salvage and firewood gathering from system interior roads can occur using ground based methods without additional road construction. Landings can be provided adjacent to existing roads.

C-2. Do Nothing.

5. What are the Consequences of Not Changing?

The Plan would not facilitate achieving the Desired Condition of balancing ecological processes with social and economic benefits in the face of an aging forest and projected increase in oak decline. Plan direction would inhibit the agency's ability to respond to future unpredictable insect, disease, and catastrophic weather events that may occur in many areas of the Forest.

Proposed Action

Propose Option C1.

6. Recommendations for Plan Revision

The recent increase in gypsy moth activity has revived the need to consider salvage harvest guidance. Include desired conditions and standards and guidelines that allow salvage in:

- 1) Special Biologic Areas as long as the biologic entity is not impaired by the salvage;
- 2) Scenic corridors as long as the scenic objectives are met; and
- 3) Remote backcountry recreation areas as long as there is no road construction and the remote character is not impaired.

Issue Forest Access

A1. System Roads in Wildlife Management Areas

1. What was the Plan Striving For?

The 1993 Revised Plan recognized that the desire for motorized access to the Forest must be balanced against conflicting desires of providing for certain types of wildlife habitat and non-motorized recreation use (Plan, page 2-17). Under the Revised Plan, a road system is to be maintained to serve the public, meet management needs, and protect resources in a cost-effective manner (Plan, page 2-17). Decisions that determine whether individual roads are open or closed to public vehicular use are to be made on a case by case (road by road) basis. Existing roads may be closed under one of the certain conditions, including meeting open road densities in Management Areas (MA) 14 or 15. (Plan, page 2-18 as corrected)

MA 14's desired condition is to maintain or enhance quality habitat for black bear and other disturbance-sensitive species (Forest Plan, page 2-29). The Desired Condition (DC) of MA 14 is to have motorized public vehicle access be restricted to provide suitable conditions for disturbance-sensitive species such as black bear (Forest Plan page 3-74 and 3-76).

MA 15's desired condition is to maintain or enhance quality habitat for wild turkey and other species that favor a more mature forest environment with small, herbaceous clearings (both temporary and permanent (Forest Plan, pages 2-29 and 3-79).

Both MAs have objectives to limit open interior road densities. For MA 14, the objective is to limit open interior road densities to no more than one-quarter mile of open road per 1,000 acres (Plan, Standard 14-7, page 3-75). For MA 15, the objective is to limit open interior road densities to no more than one mile of open road per 1,000 acres (Plan, Standard 15-5, page 3-81).

2. Where is the Plan Now?

During project-level analysis, the Forest knows of no roads that have been closed or were strived to be closed to meet this Plan objective for MA 14 and 15, even though in 1994, a [GIS analysis](#) was conducted to determine the number of areas where interior open road densities exceeded the objectives set for Management Areas 14 and 15. At that

time [North half](#) and [south half](#) maps were also produced to show where Plan road management objectives for managing black bear and wild turkey, exceeded on-the-ground conditions. The analysis shows that 26 Management Area polygons (37% of total) exceed the open road density standards within Management Areas 14 and 15. In contrast, 44 polygons (63% of total) do not exceed the road density standards. There are 23 unique Management area 14 polygons with 11 exceeding Plan standard 14-7. There are 47 unique Management area 15 polygons with 15 exceeding Plan standard 15-5.

Black bear and wild turkey are Management Indicator Species under the 1993 Revised Plan. While road closures have been thought to be the way to increase populations of these species, monitoring of these species shows that their populations continue to increase even though no attempts were made to close roads to meet certain open road density objectives within certain management areas. However, the agency recognizes that roads may or may not be a critical indicator of why populations have increased. Populations may have increased due to other factors such as game regulation changes, weather affecting hunter's success, or even the number of hunters (VDGIF 2002).

[Monitoring](#) of black bear by Virginia Department of Game and Inland Fisheries shows the following increasing trend in populations from 1989 to 1998. In 2000, VDGIF and WVDNR estimated bear populations at 1,175 individuals on the GWNF (2004 Monitoring Report at page 96.)

**Virginia's Black Bear Population Trend, 1989 to 1998
(Downing Method)**

<u>Sex</u>	<u>Population Growth Trend (%) per year</u>	<u>R-Square</u>	<u>Significance</u>
Male	+ 7.4	0.97	P<0.97
Female	+ 4.2	0.91	P<0.91

[Monitoring](#) of wild turkey shows the following. The data suggests that total harvest numbers vary across years, but indicate an overall stable to slightly increasing population trend. In 2000, VDGIF and WVDNR estimated turkey populations at 4,149 individuals on the GWNF.

**Spring Wild Turkey Harvest Information on GWNF, 1997 To 2006 (Source:
<http://www.dgif.state.va.us/wildlife/turkey/nationalforestspringturkeyharvest2006.pdf>)**

<u>County</u>	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Harvest /square mile
Allegheny	102	45	87	74	148	117	112	83	88	88	0.34
Amherst	34	26	30	30	37	43	51	32	40	35	0.39
Augusta	158	93	95	139	158	157	122	86	56	114	0.37
Bath	134	91	153	133	221	164	106	99	66	119	0.44
Botetourt	99	45	41	52	93	84	91	65	58	66	0.54
Frederick	4	6	4		3	3	6	5	6	8	1.04
Highland	26	26	41	47	61	38	32	17	22	36	0.40
Nelson	6	3	6	4	2	12	3	3	2	6	0.20
Page	10	6	6	7	13	5	8	6	9	20	0.47
Rockbridge	43	31	26	24	45	63	35	38	41	50	0.48

<u>County</u>	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Harvest /square mile
Rockingham	125	63	68	57	91	93	92	76	53	92	0.42
Shenandoah	57	41	31	20	48	48	47	60	44	70	0.59
Warren	3	4	3	3	9	5	9	6	3	3	0.31

(Source:

http://www.dgif.virginia.gov/hunting/va_game_wildlife/national_forests_spring_turkey_2004.pdf).

For black bear, the 2004 revised Jefferson Forest Plan objectives 8.01 and 8C-OBJ4 are to provide areas where open road density is less than 0.8 miles per square mile (Jefferson Plan, page 2-13; Management Prescription 8C, objective 8C-OBJ 4, page 3-122.) (1.25 miles per 1,000 acres) Likewise, for old growth forest communities associated with disturbance, objective 6C-OBJ2 says to maintain an open road density at or below .8 miles per square mile (Jefferson Plan, page 3-82 errata #1.)

For species such as wild turkey, the 2004 revised Jefferson Forest Plan objectives 8A1-OBJ4 and 8B-OBJ3 are to maintain an open road density at or below 1.25 miles per square mile (See Management Prescription 8A1 and 8B, objective 8A1-OBJ4, page 3-114; objective 8B-OBJ3, page 3-118 2.0 miles per 1,000 acres). The table compares the 1993 Revised Plan with the 2004 Jefferson Plan for open road density direction in wildlife areas.

Comparison of Open Road Densities between Forest Plans

<u>Area</u>	<u>Open Road Mileage per 1,000</u>	
	<u>Acres</u>	
	<u>George Washington Forest Plan</u>	<u>Jefferson Forest Plan</u>
Remote Habitat For Wildlife	0.25	1.25
Mix of Successional Habitats	1.00	2.00

Socially, the agency has had public pressure from the environmental community to close roads that are currently open seasonally or year-round to the public. Conversely, we've had public pressure from certain hunting associations to open roads that are currently closed year-round.

3. Did Management Activities Move the Forest towards the Desired Future condition?

The Forest did not meet any of its objectives of closing roads to public motorized use year-round where open road densities exceed desired densities in wildlife-emphasized management areas. However, black bear and wild turkey populations are stable to increasing.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? Black bear and wild turkey populations are stable to increasing even though GW Forest Plan road density objectives were not met. Furthermore, road density objectives are different between the GW and Jefferson Forest Plans. Thus, the Forest believes

there is no need to close roads for the sole purpose of providing wildlife habitat for black bear and wild turkey.

c. Tentative Options or Proposed Actions for Change (If the Revised Plan identifies distinct wildlife emphasis areas like MA 14 and MA 15)

- C-1. Adopt as George Washington Plan objectives the Jefferson Plan standard.
- C-2. Reallocate the eleven MA 14 polygons that exceed Plan standard 14-7 to Management Areas that have no open road density objectives. Reallocate the fifteen MA 15 polygons that exceed Plan standard 15-5 to Management Areas that have no open road density objectives.
- C-3. Remove the existing standards 14-7 and 15-5 and adopt the language from the Revised Jefferson Plan that says “existing open public roads are maintained at current density levels to provide for public access and safety.”
- C-4. Reassign GW standards 14-7 and 15-5 as objectives in MA 14 and MA 15 and leave the road density figures alone.
- C-5. Remove the existing standards 14-7 and 15-5 and create standard that roads should be closed during nesting and brooding rearing seasons and then can be opened during fall hunting seasons. (See also Wildlife discussion at the end of this report.)

5. What are the Consequences of Not Changing?

This is more a social value than a significant environmental effect on bear and turkey habitat and populations. Some environmental groups will criticize the Forest for not attempting to close roads; while some sportsman groups will criticize the Forest for not opening more roads, especially during all hunting seasons.

Proposed Action

Propose Option C5.

6. Recommendations for Plan Revision

In the revised Plan we will not have different management areas for remote wildlife, early successional habitat species, timber management and mosaics of habitat. Instead, we will have desired conditions for the portion of the forest where we want a diversity of habitat and production of wood products. However, to meet the desire to retain areas where road density is low, we will have an objective to not increase the miles of open road on the Forest. We will also continue to work closely with the State game agencies in establishing seasons when roads should be closed to benefit wildlife species.

A2. System Roads across the Forest

1. What was the Plan Striving For?

The 1993 Revised GW Plan continued the existing management direction of identifying and evaluating open roads. Roads that serve a legitimate access need, are consistent with the management area direction and meet standards in the Revised Plan were to remain open to public use. When they did not meet these requirements, these routes were to be permanently closed or improved, as funding permitted (Plan, page 2-18).

Decisions that determine whether individual roads are open or closed to public vehicular use are to be made on a case by case (road by road) basis. Existing roads may be closed under certain conditions, besides meeting open road densities in Management Areas (MA) 14 or 15. Fundamentally, existing roads may be closed if they are causing resource damage to soil and water functions. These conditions also include a) roads that will not be needed again (by placing physical barriers and ripping and seeding road), b) roads that will not be needed for several years (by placing a physical barrier such as large boulders at the entrance, and c) roads only needed for administrative purposes (by placing a locked gate at the entrance (Plan, page 2-18).

Under the Revised Plan, a road system was to be maintained to serve the public, meet management needs, and protect resources in a cost-effective manner. New roads were to be constructed as needed and to the standard to meet the desired future condition identified in each management area. The decision to construct any additional roads was and continues to be made when projects are selected and supported by appropriate site-specific analysis and documentation (Plan, page 2-17). The 1993 Revised Plan estimated that between 5 to 8 miles of roads would be constructed yearly (Plan, page 2-17).

2. Where is the Plan Now?

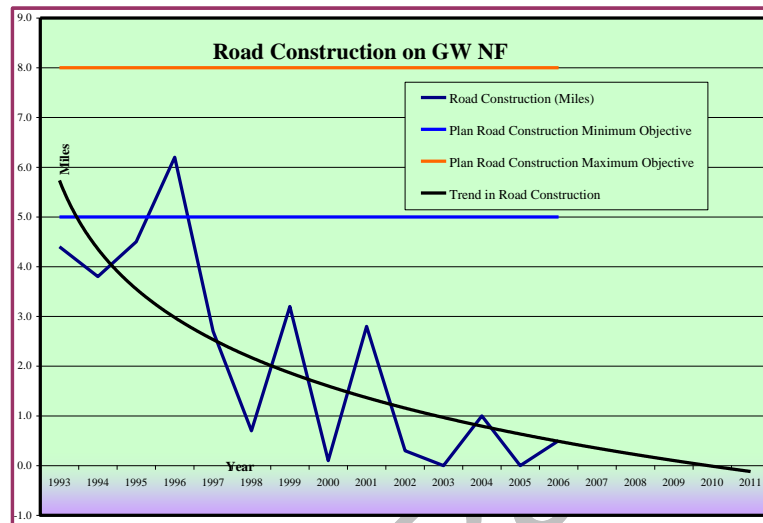
The percentage of roads open to the public decreased slightly with the implementation of the Revised Plan, but has since remained stable. The Forest has decommissioned one mile or less of existing roads per year. The transportation system management trend across the Forest is shown in the table below. It should be noted that it appears road mileage is significantly up in 2006. This discrepancy is due to the fact that in previous years, the miles of Forest roads was pulled from the Infrastructure database and the 2006 data was extracted from the Forest's GIS roads layer. The GIS data more accurately depicts what exists on the ground; therefore the lengths of roads are closer to actual than the estimated lengths recorded in the Infrastructure database.

Infrastructure road lengths may have been erroneous due to the fact that not all roads on the Forest have been located by GPS.

Year	Total Forest	Open Year-round Or Seasonally		Closed Year-round	
	(Miles)	(Miles)	(Percent of Total)	(Miles)	(Percent of Total)
1984	1,330	1,170	88	160	12
1993	1,760	1,050	60	710	40
1999	1,700	1,012	60	688	40
2003	1,798	973	54	825	46
2004	1,798	973	54	825	46
2006	1,872	1007	54	865	46
2007*				237	

*See Motor Vehicle Use Map document at http://www.fs.fed.us/r8/gwj/maps_brochures/mvum.shtml

The Forest has focused road funding on maintenance activities instead of construction and reconstruction. The trend in miles of construction of new roads has steadily declined, as depicted in the following graph.



3. Did Management Activities Move the Forest towards the Desired Future condition?

No.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? Road construction objective was not met. Road construction is a function of a project's purpose. Road management across the George Washington NF has followed the direction in the 1993 Revised Plan with no real conflicts or detours from guidelines. The review and evaluation of current information, including the Roads Analysis Report for the GWNF completed in 2003, and the Revised Jefferson NF Plan lead to the recommendation there is nothing new to incorporate into the Revised GW Plan. However, the forest will be completing a Transportation Analysis Process (TAP) in 2010 that will further refine the roads analysis done in 2003.

c. Tentative Options or Proposed Actions for Change

C-1. Delete road construction as an objective of the Plan.

C-2. Do nothing. The existing road construction objective remains.

C-3. Review the TAP results as soon as available before making a recommendation but for now delete road construction as an objective of the Plan.

5. What are the Consequences of Not Changing?

An erroneous objective related to road construction would be displayed in the plan, but would have little effect on actual need to construct roads. The consequences of not changing the current plan direction and management of roads on the Forest would be that emphasis on road maintenance, reconstruction and decommissioning would continue with very little construction of new roads. This management is consistent with historical road funding received on the Forest.

Proposed Action

Propose Option C3.

6. Recommendations for Plan Revision

It does not appear that there is a need for an objective for permanent road construction. However, scoping may identify changes. Since old unclassified roads continue to be identified and other roads are identified that no longer meet access needs, taking into consideration the issues identified, benefits and risks analyzed and the recommendations for a minimum road system contained in the 2010 Transportation Analysis Process, there will be an objective to decommission roads.

B. Licensed OHV Use

1. What was the Plan Striving For?

The Plan recognized the spectrum of areas that are highly roaded (greater than 3 miles per 1000 acres) to essentially unroaded with less than .25 miles per 1000 acres (Plan page 2-17). There is a stated recognition of the need to balance the public desire for motorized access to the national forest with the often conflicting goals of providing certain wildlife habitat and non-motorized, backcountry recreational opportunities.

In the area of licensed OHV use (full sized four wheel drive vehicles- not ATV's or motorcycles), the planning effort produced a total of 157 miles of featured open roads allocated to OHV use and identified an additional 60 miles of roads suitable, at least seasonally, for such use. There was a clear recognition that the demand existed for this use in the early 1990's and by allocating certain roads in Management Area 11 there was a desire to retain these roads as much as possible in their rough and challenging condition to meet this demand. Without this allocation these roads would have been susceptible to either upgrading to a higher level or closure, either choice precluding the OHV opportunity. There was also a prediction in the Plan EIS that the OHV road mileage would need to more than double to meet the anticipated demand by 2000.

2. Where is the Plan Now?

The existing allocated OHV road network is largely intact. There has been some repair on a few roads over the past 15 years to correct erosion problems contributing to watershed impacts. Three roads initially listed in the Plan have been closed either by nature or through site-specific decisions: A decision was made in 1998 to close Jerkemtight road, while floods from 1995 through 1997 closed Cashew Road. Poplar Cove road was also closed after a site-specific analysis. A few of the MA 11 roads are classified as TSL D. No additional roads have been added to the MA 11 allocation. A review of INFRA indicates there are currently a total of 244 miles of roads having an objective Maintenance Level of 2 – High Clearance.

3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? ? Executive Order 11644, Use of Off-Road Vehicles on the Public Lands, required public land agencies to administratively designate specific areas and trails on public lands on which the use of off-road vehicles may be permitted, and areas in which they are not permitted. The process to designate roads and trails as open or seasonally open to motorized use, and whether that motorized use is limited to highway legal vehicles only or to all vehicles, was in accordance with the following criteria and are displayed on a set of Motor Vehicle Use Maps for the Forest:

- Minimize damage to soil, watershed, vegetation, or other resources;
- Minimize harassment of wildlife or significant disruption of wildlife habitats;
- Minimize conflicts between off-road vehicle use and other existing or proposed recreational uses of the same or neighboring public lands, and to ensure the compatibility of such uses with existing conditions in populated areas, taking into account noise and other factors;
- Avoid designated Wilderness Areas or Primitive Areas.

5. Recommendations for Plan Revision

Do not provide designated OHV routes or areas in the Forest Plan. The roads and trails open or seasonally open to OHVs are included on the 2008 Motor Vehicle Use Maps.

C. Non-Motorized Trails

1. What was the Plan Striving For?



The current GW plan is striving for a non-motorized trail system providing for a mix of uses including hiking, horseback riding, mountain biking, and backpacking in which the “Share the Trail” concept is promoted. Emphasis is placed on multi-use trails wherever feasible. This concept minimizes the provision of single use trails and thereby better controls total trail mileage, environmental effects, and maintenance costs. The 1993 non-motorized trail mileage was about 950 miles, including two National Recreation Trails (Lion’s Tale and Wild Oak)

and about 60 miles of the Appalachian National Scenic Trail. The plan identifies approximately 300 miles of potential trail to be constructed and 92 miles reconstructed over the course of the planning period if funding allows. The Appalachian Trail has a discreet Management Area (MA6) in the GW plan indicating the emphasis placed upon this nationally prominent trail resource.

2. Where is the Plan Now?

Approximately 18 identified trail reconstruction projects from the current plan, totaling about 38 miles have been completed. Approximately 28 identified construction projects totaling about 75 miles have been completed. A few trail construction and reconstruction projects in addition to those identified were also completed since 1993 and some trails were removed from the system. Most of the trails are multi-use, having more than one managed use. Based on INFRA, current non-motorized trail mileage on the GW is 1066 miles. This represents a net 12% increase since 1993. Some of this increase is due to more accurate mileage measurements.

3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? No

b. Why? . The current trails emphasis in the GW plan on non-motorized trails seems to be consistent with prevailing social attitudes. The Public Survey report, Southern Appalachian National Forests, 2002 (Cordell) identifies day hiking, mountain biking, backpacking, and horseback riding, as respectively the 5th, 13th, 18, and 19th most popular recreational activities on the GW. Almost 34% of respondents hiked on the GW at least once that year. The other non-motorized uses were substantially lower but there is no statistical evidence or surveys indicating that demand for non-motorized use is declining. Based on qualitative evidence from public contacts and volunteerism, equestrian and mountain bike use and interest is continuing to increase. Hiking and backpacking use fluctuates considerably based on seasonal weather conditions but appears to be remaining steady to increasing slightly. This is based on A.T. ridgerunner sampling between 2002 and 2004 for hikers and backpackers passing through the Tye River section of the A.T.

An administrative change is necessary to show the existing AT corridor due to several minor relocations which have taken place since 1993. For instance, the A.T.s crossing of the James River on the AT pedestrian bridge is not depicted properly. This is shown on the [attached map](#) where the corridor needs to be properly identified and the old corridor reassigned to an adjoining management area direction. Construction of portions of the Alleghany Highlands Trail System on the James River and Warm Springs Districts has been completed by the Boy Scouts of America Order of the Arrow (ArrowCorps 5) in 2008 and Student Conservation Association trail teams in 2010.

5. Recommendations for Plan Revision

Public input emphasized the large demand for and enjoyment of the expansive trail system on the Forest. The Forest has the largest mileage of trails among the National Forests in the Southern Region. Given the large number of trail miles, we do not believe that we can expand. We will have an objective to retain current levels or slightly decrease trail miles. There may be limited additional trails, but some trails with low use may be abandoned so that new opportunities can be achieved.

We received public input with concerns related to use of trails for wildland fire and prescribed fire lines. We will add standards and guidelines to assure that when existing trails are used as firelines, they are maintained in, or returned to, the character desired by the users. We will also look for opportunities to improve trailhead parking for users of the trails.

D. Access for Persons with Disabilities



Sherando Lake Fishing Pier

1. What was the Plan Striving For?

The 1993 Revised Forest Plan addressed access for persons with disabilities with the following statement, *“The Revised Plan encourages the continued exploration of methods to provide access to persons with disabilities in accordance with the Americans with Disabilities Act and other applicable legislation. The Forest Service intends to continue to seek*

such opportunities as the Revised Plan is implemented.” Under Issue 13, The Mix of Goods and Services, the plan states, *“In accordance with the Americans with Disabilities Act (ADA) and other applicable legislation, most developed recreation facilities are made accessible as funding allows.”* The Plan did not have any objectives related to access for persons with disabilities.

2. Where is the Plan Now?

The intent of providing access to persons with disabilities is still valid, and indeed, there has been considerable progress made and many new and reconstructed developed recreation facilities are now accessible.

Likewise, the Forest Service nationally has better defined direction for providing accessibility. It is the Architectural Barriers Act of 1968 (ABA) and Section 504 of the Rehabilitation Act of 1973 that apply to the Forest Service. The applicable document for all new construction and alteration of Forest Service facilities under these laws is the *Architectural Barriers Act Accessibility Standards (ABAAS)*. Chapter 10 of the ABAAS addresses some recreation facilities but not camping and picnicking areas, outdoor recreation access routes, beach access routes, and pedestrian trails. These recreation facilities are addressed in the *Forest Service Outdoor Recreation Accessibility Guidelines (FSORAG)* and the *Forest Service Trail Accessibility Guidelines (FSTAG)*. On May 22, 2006, the Forest Service published, in the *Federal Register*, notice of the final directive that requires compliance with the FSORAG, effective on that date.

The 1993 Revised Forest Plan utilizes inaccurate terminology and limited itself in how it deals with the accessibility issues to developed recreation and disabled hunters.

The Plan inaccurately refers to *The Americans with Disabilities Act of 1990* (ADA), which does not apply to Federal Agencies with the exception of Title V, Section 507c that defines a wheelchair and states that wheelchairs may be used in Wilderness.

The 1993 plan implied that access for persons with disabilities was just for developed recreation areas and disabled hunters. Thus it is limited because access for persons with disabilities is to be provided to all programs and activities as well as all new and altered facilities on the Forest. Facilities are the physical features that are provided such as toilets, picnic tables, interpretive centers, and water fountains. Programs and activities are the things people do such as picnicking, camping, watching wildlife, hiking, listening to interpretive programs, etc. With funding constraints and construction limitations, as well as allowed exceptions, some facilities at some locations may not be accessible, but accessible opportunities will be provided in all program areas.

3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes, The Forest has made great strides in providing universal access at developed recreation facilities. In 2001 a programmatic transition plan was completed for the George Washington and Jefferson National Forests as required by 7 CFR 15e, the USDA implementation of Section 504 of the Rehabilitation Act of 1973. This transition plan shows that most programs on the Forest are accessible. There is now the opportunity for persons with disabilities to participate in all or most program activities.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes.

b. Why? Plan direction should incorporate current Forest Service policy of universal design ([FSM 2330](#)), by reference, to provide universal access to facilities and programs of the George Washington National Forest. Legal requirements should be corrected and clarified. Reference to the ADA is in error. c. Tentative Options or Proposed Actions for Change

C-1. Modify the Forest Plan by:

- a) Adding a standard or guideline that references Forest Service policy ([FSM 2330](#)) on universal access and use of the FSORAG and FSTAG when designing or rehabilitating recreation facilities..
- b) Making administrative corrections by adding legal references to American Barriers Act of 1968 and the Rehabilitation Act of 1973, removing the Americans with Disabilities Act reference and outdated terminology such as the word "handicap" and all its variations.

C-2. Do nothing.

5. What are the Consequences of Not Changing?

Regardless of what the Forest plan says, the requirements exist to provide access at all newly constructed or altered facilities in accordance with the referenced laws. It isn't necessary to include anything about access for persons with disabilities in the forest plan, because there are laws that require it. However, inclusion will keep the laws in the open and ensure that managers remain aware that there is still work to be done.

Proposed Action

Propose Option C1.

6. Recommendations for Plan Revision

The appropriate standards and guidelines will be included in the revised Plan.

Issue All-Terrain Vehicle (ATV) Use

1. What was the Plan Striving For?

The GW Plan was striving to accommodate this use but limit it to specific areas where the impacts could be feasibly mitigated and monitored. ATV's are allowed only on designated routes. Otherwise the forest is closed to off road and off-trail motorized use. The 1993 planning effort produced a total of 50 miles of designated ATV (unlicensed ATV's and motorcycles) routes in three areas: Taskers Gap/Peters Mill Run on the Lee District, Rocky Run on the Dry River District, and South Pedlar on the Pedlar District. It also called for an additional 15-mile system to be established on the Deerfield District if ATV organizations expressed interest and sponsorship for the project. The forest worked with several ATV organizations to identify potential areas where trail systems could be developed. Only a quarter of the potential areas were deemed suitable based upon environmental affects and the degree of conflict with other uses and services. The Plan EIS included an estimate that an additional 331 miles of ATV routes would be needed to meet the anticipated demand by 2000.

2. Where is the Plan Now?

Current total ATV route mileage for the three active areas is about 60 miles. The Rocky Run Area received significant flood damage in 1996 (Hurricane Fran) to the lower Rocky Run Trailhead and access trail. This access has been closed since that time and a final decision has not been made on its reestablishment. The proposed system on the Deerfield District did not become established due primarily to the lack of sponsorship from any ATV organizations. The Taskers Gap/Peters Mill Run and South Pedlar Areas continue to function and are popular trails. Both areas require frequent maintenance which is typically beyond the capability of the forest trail maintenance funding level and has been done through special regional and national allocations and Virginia Recreation Trails Fund grants.

3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? No

b. Why? Cordell's study, discussed under the Licensed OHV issue, does not differentiate ATV and motorcycle users from the sample so it is difficult to say how that data pertains to the unlicensed motorized users. However, it is pertinent that Cordell's study showed that a relatively low percentage of all GW respondents (12.1%) supported the objective of expanding access for motorized off highway vehicles.

There are no statistics to indicate that the demand for ATV trail mileage has increased as dramatically as predicted in the 1993 Plan but ATV and off-road motorcycle sales have increased substantially. However, based upon the expected use of the Jefferson Plan's Appendix H "Screening Criteria for New OHV Areas", it is doubtful that any new areas can be found to be suitable, including the Archer area on the Deerfield District, proposed in the 1993 Plan. The forest is very likely at the limit of its ability to support ATV use due to the relatively substantial environmental impacts and high costs of maintaining these systems.

5. Recommendations for Plan Revision

The Forest will retain the existing ATV areas, but not add any more.

Issue Roadless Area Management

A. Existing Inventoried Roadless Areas

1. What was the Plan Striving For?

The GW Plan EIS evaluated 27 inventoried roadless areas totaling more than 260,000 acres. The Plan allocated the roadless areas among the various Management Areas. Three areas, totaling about 12,000 acres were recommended for Wilderness Study (MA 8): The St. Mary's Addition, Three Ridges, and the Priest. The vast majority of the remaining acreage was allocated to Remote Highlands (121,000 acres), Special Management Areas (60,000 acres), and Special Interest Areas (32,000 acres). The Special Management Areas included Big Schloss, Little River, Laurel Fork, and Mt. Pleasant, each with its own Desired Future Condition and standards. According to the Plan, 89% of the roadless acreage is allocated to management areas which would preserve the roadless character. On the remaining 11%, approved projects could alter the roadless nature of a given area.

2. Where is the Plan Now?

During the mid 1990's there were a few projects within roadless areas, including three small timber sales affecting four roadless areas. There has also been some prescribed fire and minor trail relocation and construction in a few areas. However, these projects did not disqualify any area from the roadless inventory based upon FSH Handbook definitions. In 1994, the Mount Pleasant area was designated a National Scenic Area by Congress. The Plan was amended slightly based upon the provisions in the law. In 2000, the Priest and Three Ridges areas were designated as wilderness by Congress.

On January 12, 2001 the Department of Agriculture promulgated the Roadless Conservation Rule. That 2001 rule:

1. Prohibited new road construction and reconstruction in inventoried roadless areas on National Forest System lands, except:
 - To protect health and safety in cases of an imminent threat of flood, fire, or other catastrophic event that, without intervention, would cause the loss of life or property.
 - To conduct environmental clean up required by federal law.
 - To allow for reserved or outstanding rights provided for by statute or treaty.

- To prevent irreparable resource damage by an existing road.
 - To rectify existing hazardous road conditions.
 - Where a road is part of a Federal Aid Highway project.
 - Where a road is needed in conjunction with the continuation, extension, or renewal of a mineral lease on lands that are under lease, or for new leases issued immediately upon expiration of an existing lease.
2. Prohibited cutting, sale, and removal of timber in inventoried roadless areas, except:
- For the cutting, sale, or removal of generally small diameter trees which maintains or improves roadless characteristics and:
 - •To improve habitat for threatened, endangered, proposed, or sensitive species, or
 - •To maintain or restore ecosystem composition and structure, such as reducing the risk of uncharacteristic wildfire effects.
 - When incidental to the accomplishment of a management activity not otherwise prohibited by the rule.
 - For personal or administrative use.
 - Where roadless characteristics have been substantially altered in a portion of an inventoried roadless area due to the construction of a classified road and subsequent timber harvest occurring after the area was designated an inventoried roadless area and prior to the publication date of the rule.

The 2001 roadless rule was the subject of nine lawsuits in Federal district courts. On July 14, 2003, the U.S. District Court for the District of Wyoming found the roadless rule to be unlawful and ordered that the rule "be permanently enjoined." The Department of Agriculture revised the Roadless Area Conservation Rule on May 5, 2005 by adopting a new rule that established a State petitioning process that allowed State-specific consideration of the needs of these areas as an appropriate solution to address the challenges of inventoried roadless area management on National Forest System (NFS) lands.

On November 29, 2006 a federal judge in California set aside the State Petitions Rule and reinstated the 2001 Roadless Rule enjoining the Forest Service "from taking any further action contrary to the Roadless Rule without undertaking environmental analysis consistent with this opinion."

In an August 12, 2008 ruling, the Federal District Court for the District of Wyoming again held that the 2001 Roadless Area Conservation Rule was unlawfully promulgated in violation of the National Environmental Policy Act and the Wilderness Act. The Wyoming court declared that "the roadless rule must be set aside" and that "[t]herefore, the Court **ORDERS** that the 2001 Roadless Rule, be permanently enjoined for the second time"

With conflicting rulings in the California and Wyoming Federal Courts, the California judge clarified her opinion in a December 2, 2008 ruling. "Therefore, in the spirit of comity, the Court partially stays its injunction as to states outside the Ninth Circuit and New Mexico, pursuant to Rule 62(c). The injunction remains in full effect in all other respects."

The George Washington National Forest Plan does not have guidelines that require that all inventoried roadless areas retain their roadless characteristics, yet the management prescribed for the areas accomplishes nearly the same result. Ninety-five percent of the roadless areas are classified as unsuitable for timber production. There are very limited provisions for the harvest of dead or dying trees along the perimeters of some of these areas. In the George Washington Plan, road construction is prohibited on 88 percent of the areas with some exceptions to provide for site specific needs. Examples of these exceptions where new road construction could be allowed include: 1) to access approved mineral activities; (2) where the new road is the only prudent alternative to serve resource needs in adjacent management areas and it will minimally impact this management area; (3) to relocate existing roads; (4) to provide access to trailheads or (5) to provide access to private land if no other route is feasible.

Inventoried Roadless Areas of National Forest System Land:

National Forest	Roadless Areas (Number)	West Virginia (Acres)	Kentucky (Acres)	Virginia (Acres)	Grand Totals (Acres)
George Washington*	27*	17,331	0	243,902	261,233
Jefferson**	37	4,818	0	147,772**	152,590
Total Both Forests	52	22,149	0	391,674	413,823

* Total from 1993 Revised Forest Plan: However the Priest (5,726 roadless ac.) and Three Ridges (4,702 roadless ac.) were designated Wildernesses by Congress in 2000. Mt. Pleasant (8,905 roadless ac.) was designated a National Scenic Area in 1994.

** Includes Beaverdam Creek, London Bridge Branch, and Rogers Ridge which predominately lie on the Cherokee National Forest in Tennessee.

Permanent Road Construction Not Allowed within Inventoried Roadless Areas:

National Forest	Permanent Road Construction Not Allowed (Acres)			
	West Virginia	Virginia	Total	%
George Washington**	13,524	217,421	230,945	88%
Jefferson	4,818	147,772	152,590	100%
Total	18,342	365,193	383,535	93%

* Based on land management allocations in revised Forest Plans

** GW Management Areas 4, 6, 8, 9, and 21.

Timber Harvesting within Inventoried Roadless Areas:

National Forest	Timber Harvesting Allowed for Stewardship Purposes* (Acres)				Timber Harvest Not Allowed Except for Salvage of Dead, Dying, or Damaged Trees (Acres)			
	West Virginia	Virginia	Total	%	West Virginia	Virginia	Total	%
George Washington**	1,149	13,034	14,183	5%	16,182	230,868	247,050	95%
Jefferson	2,931	32,004	34,935	23%	1,887	115,768	117,655	77%
Total	4,080	45,038	49,118	12%	18,069	346,636	364,705	88%

* Stewardship Purposes Include:

- Improving or Maintaining Wildlife Habitat
- Reducing the Risk of Wildfire, Insects, or Diseases
- Restoring Ecological Structure, Function, Processes, or Composition
- Enhancing or Rehabilitating Scenery
- Salvage of Dead, Dying, or Damaged Trees

3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes. No management activity disqualified an areas' suitability for Congressional wilderness designation. A roadless area's characteristics remain intact.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? There is a need to update the existing inventory to remove the areas designated wilderness and national scenic area. There may also be a need for change revised national direction on inventory criteria, new terminology (potential wilderness areas) and roadless area management.

c. Tentative Options or Proposed Actions for Change

Under all following options The Priest (5,726 roadless ac.), Three Ridges (4,702 roadless ac.) and Mt. Pleasant (8,905 roadless ac.) should be dropped from the roadless inventory because these areas are now congressionally designated areas. Therefore there are now 24 inventoried roadless areas.

C-1. Adopt the 2001 Roadless Rule as a standard; yet leave the existing management area allocations as identified and delineated in the 1993 GW Forest Plan.

C-2. a) Remove the three Special areas designations (Laurel Fork, Little River, and Big Schloss) and assign them to existing GW Remote Highlands (Management Area 9 or Jefferson Prescription 12B – Remote Backcountry); b) assign the remaining 21 roadless areas to existing GW Remote Highlands Area 9. c.) Add a standard that the inventoried roadless areas be managed under the 2001 Roadless Conservation Rule or whatever roadless rule is in effect.

C-3. Modify the Forest Plan by:

- h) Identifying Remote Backcountry areas that include: a) the three special area designations (Laurel Fork, Little River, and Big Schloss); b) the existing GW

Remote Highlands area (Management Area 9); and C) the portions of the 21 inventoried roadless areas not currently in GW Remote Highlands area.

- i) Adding a standard that inventoried roadless areas will be managed under the current agency roadless policy and direction.
- j) Adding a standard that where conflicts occur between management of inventoried roadless areas and known locations of special botanical – zoological areas, the biological values will be addressed first.

C-4. Allocate the roadless areas that allow road construction and timber harvesting to management area direction that avoid new road construction and reconstruction and cutting, sale, and removal of timber as per the table discussed above. See table on following pages. The areas proposed for change are also highlighted on the linked map.

5. What are the Consequences of Not Changing?

The Forest must update to reflect congressional designations. The Forest must also comply with any national rules on management of inventoried roadless areas.

Proposed Action

Propose Option C3.

6. Recommendations for Plan Revision

There is currently no roadless rule in place for the Forest. There was support for continuing to manage all of the inventoried roadless areas under the restrictions of the 2001 Roadless Conservation Rule. There was also interest in returning some of these areas to active management. The portions of the areas that were managed as Remote Highlands will be identified as remote backcountry areas. These will continue to be managed as unsuitable for timber production and with a prohibition for road construction (with limited exceptions). Salvage harvest will be allowed as described in the salvage section. Many of the remote backcountry recreation areas will be expanded to include the entire Inventoried Roadless Area. However, there was a common theme among many workshop attendees that we should continue to manage where we have good road access and reduce management in areas where there is poor road access. To respond to this concern, we will leave the roaded portions of a number of the Inventoried Roadless Areas in active management if they are currently in actively managed Management Areas (14, 15, 16, 17).

The following table displays these changes. A number of the remote backcountry areas contain special biological areas within them. Kelley Mountain is entirely a Special Biological Areas.

Roadless Area	W&S Rivers	Special Biological Areas	Mosaics of Wildlife Habitat	Dispersed Recreation	Remote Backcountry Recreation Acres	Total Roadless Area Acres
Adams Peak					7,282	7,282
Beards Mountain		x			7,504 - x	7,504
Big Schloss		x			20,811 - x	20,811
Crawford Mountain			1,000		8,852	9,852
Dolly Ann		2,068	800		4,998	7,866
Dry River (WV)		3,497	500		3,257	7,254
Elliott Knob		945	200		8,246	9,391
Gum Run		4,300			8,320	12,620
Jerkentight		1,230	800		14,819	16,849
Kelley Mountain		7,742				7,742
Laurel Fork		10,053				10,053
Little Alleghany		x - lbat	700		10,207-700-x	10,207
Little River	100	3,293	300	735	22,752	27,180
Mill Mountain		435	3,331		7,153	10,919
Mount Pleasant			735			735
Northern Massanutten					9,459	9,459
Oak Knob		2,975	800		7,077	10,852
Oliver Mountain					13,089	13,089
Ramseys Draft Add.		2,447			10,367	12,814
Rough Mtn Add.					1,154	1,154
Saint Mary's Add.					1,478	1,478
Skidmore		3,823			1,794	5,617
Southern Massanutten					12,080	12,080
The Friars					2,051	2,051
The Priest	Remove From Inventory - now Wilderness					
Three Ridges	Remove From Inventory now Wilderness					
Three Sisters					8,154	8,154

In addition, some of these areas may be considered for recommendation as wilderness.

B. New Potential Wilderness Area Inventory

The first step in the evaluation of potential wilderness is to identify and inventory all areas within the National Forest System that satisfy the definition of wilderness. For areas in the Eastern United States east of the 100th Meridian), the agency's evaluation yields one of the two following options: a) Manage the area for multiple uses other than wilderness; or b) Administratively recommend the area as a Wilderness Study Area to the United States Congress. Congress would then determine whether they want the agency to study any area further.

Final agency guidance ([Forest Service Handbook \(FSH\) 1909.12 Chapter 70](#)) on identifying potential areas was released on January 31, 2007.

The methodology used to identify the Potential Wilderness Areas is described in *Guidance on How to Conduct the "Potential Wilderness Area Inventory" for the George Washington National Forest Plan*. Another document, *Areas Not Included in the Potential Wilderness Inventory*, describes rationale for why some areas were not included in the Inventory. A number of other areas were also identified for consideration by members of the public, including a publication by the Wilderness Society, *Virginia Mountain Treasures: The Unprotected Wildlands of the George Washington National Forest*. They are discussed in the document *Review of the Wilderness Society's "Virginia Mountain Treasures: The Unprotected Wildlands of the George Washington National Forest*.

The Forest identified the following 37 areas as Potential Wilderness Areas.

Potential Wilderness Name	Total GWJEFF Acres	Jeff NF Acres
Adams Peak	8,226	0
Archer Knob	7,110	0
Beards Mountain	10,152	0
Beech Lick Knob	14,087	0
Big Schloss	28,347	0
Crawford Knob	14,851	0
Dolly Ann	9,524	0
Duncan Knob	5,973	0
Elliott Knob	11,070	0
Galford Gap	6,689	0
Gum Run	14,547	0
High Knob	18,447	0
Jerkemtight	27,314	0
Kelley Mountain	12,892	0

Potential Wilderness Name	Total GWJEFF Acres	Jeff NF Acres
Laurel Fork	10,236	0
Little Alleghany	15,395	0
Little Mare Mountain	11,918	0
Little River	30,227	0
Massanutten North	16,530	0
Oak Knob - Hone Quarry Ridge	16,343	0
Oliver Mountain	13,049	0
Paddy Knob	5,987	0
Potts Mountain	7,863	844
Ramseys Draft Addition	19,072	0
Rich Hole Addition	12,165	0
Rich Patch	5,625	4,754
Rough Mountain Addition	2,063	0
Saint Mary's North	3,006	0
Saint Mary's South	1,651	0
Saint Mary's West	278	0
Shaws Ridge	7,268	0
Shawvers Run Addition	84	0
Three Ridges Addition North	83	0
Three Ridges Addition South	187	0
Three Ridges Addition Southwest	9	0
Three Ridges Addition West	90	0
Three Sisters	9,871	0
TOTAL GWJEFF ACRES	378,229	5,598
TOTAL GW ACRES ONLY	372,631	

The evaluation of each of these areas is described in *Potential Wilderness Area Evaluation*. The Forest Plan will identify those areas forwarded to the Agency for recommendation to Congress for designation as wilderness. At least one area is anticipated for recommendation. Saint Mary's Wilderness West Addition was acquired

by the Forest Service for the express purpose of expanding Saint Mary's Wilderness The Plan will also identify management desires for the rest of the areas.

Issue Special Management Areas

A. Wilderness

1. What was the Plan Striving For?

The GW Plan provided direction for the four designated wildernesses: Ramseys Draft, Rich Hole, Rough Mountain, and St. Mary's, totaling about 32,000 acres or roughly 3% of the forest's area. Three areas, totaling about 12,000 acres were recommended for Wilderness Study (MA 8): The St. Mary's Addition, Three Ridges, and the Priest. The Desired Condition is to protect and perpetuate the wilderness character and values of these areas as directed in the Wilderness Act and subsequent Wilderness designating legislation including providing opportunities for solitude, education, physical and mental challenge, inspiration, scientific study and primitive recreation. Wilderness ecosystems are the result of natural succession and natural processes with as little human intervention as possible while retaining wilderness character. There is little evidence of visitor use and low interaction among users. The few trails and associated facilities present are retained primarily to protect the wilderness resources. No motorized use is permitted. The plan provides specific standards for management of the various resources and activities that are or could potentially occur in the wildernesses including, recreation, fire, lands, minerals, fish and wildlife, insects and disease, research, search and rescue, special uses, and hydrology.

2. Where is the Plan Now?

In 2000, the Priest and Three Ridges areas were designated as Wilderness by Congress, adding an additional 10,571 acres. The St. Mary's addition, totaling about 1500 acres has not been designated but continues to be managed to retain its wilderness attributes pending Congressional action on whether to designate or have the agency study it further.

In 1998 and 2005 the St. Mary's River and several of its tributaries were treated with helicopter applied limestone sand to counteract the effects of human caused acidification on the aquatic ecosystem. This watershed may need additional treatments in the future to maintain the pH of the streams at a level to support the aquatic biota. For this action, a site specific forest plan amendment allowed for the temporary reduction in the VQO below preservation.

3. Did Management Activities Move the Forest towards the Desired Future condition?

Generally yes, except for fire management. There is no provision in the Forest Plan for managing unplanned ignitions for resource benefits in wilderness. Therefore, naturally caused (lightning) fires continue to be suppressed.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? There is need for naturally caused fires to be allowed to serve their role in the shaping of the wilderness ecosystems. This could happen to a much greater extent if direction to allow managing unplanned ignitions for resource benefits in wilderness were to be included in the Forest Plan.

The more current language from the Jefferson Plan direction regarding DFC and standards for wilderness and recommended wilderness should be used in developing the GW Plan wilderness direction.

c. Tentative Options or Proposed Actions for Change

C-1. Include managing unplanned ignitions for resource benefits as a suitable use within wilderness and adopt Jefferson standard #FW-140 that says: "FW-140: Lightning-caused fires may play their natural ecological role as long as they occur within prescribed weather and fuel conditions that do not pose unmitigated threats to life and/or private property, particularly to property within the wildland/urban interface zone."

C-2. Do nothing. Continue to disallow management of unplanned ignitions for resource benefits within Wilderness

5. What are the Consequences of Not Changing?

Fire is one of the most important and influential natural agent of change in a wilderness. Continuing to disallow lightning fire to play its natural role in the ecosystem is a significant trammeling (human control) of the wilderness. Over time, the continued aggressive suppression of fire will result in unnatural fuel buildup and increases in insects and diseases within the wilderness systems.

Proposed Action

Propose Option C1.

6. Recommendations for Plan Revision

Adopt desired conditions and standards and guidelines in the revised Plan that allow wildland fire to play its natural ecological role within wilderness.

B. Wild and Scenic Rivers

1. What was the Plan Striving For?

The GW Plan EIS identified and evaluated 14 streams located in or close to the forest. These evaluations determined which have outstandingly remarkable qualities that make them eligible for inclusion in the National Wild and Scenic River System. The evaluations also determined whether the eligible stream should receive wild, scenic or recreational classification. The streams were broken down into segments based on ownership or distinct geographical breaks. The evaluations were in accord with the 1968 National Wild and Scenic Rivers Act and were in response to and informed by the National Rivers Inventory and concerns of the American Rivers Conservation Council.

Eligibility is the initial step in the designation process. Streams or stream segments identified as eligible for designation are to be managed to preserve free-flowing conditions and to protect the outstandingly remarkable values of their segments

including the scenic, recreation, geologic, fish and wildlife, historic, and cultural values that made them eligible. Until designation decisions are made or other river studies are conducted, National Forest System lands associated with each eligible river corridor are managed to perpetuate or enhance the current conditions. Characteristics of the streams and their corridors are not to be reduced below the standards of their preliminary classification.

2. Where is the Plan Now?

The evaluation documented in Appendix D identified a total of 16 stream segments as eligible for designation based upon having at least one outstandingly remarkable value. The summary of these segments appears on page D-34 of the EIS Appendix. Most of these streams were allocated to Management Area 10, Scenic Rivers and Recreational Rivers with 55 miles of streams in the scenic river classification and 200 miles in the recreational river classification. Both classifications have corridor widths of $\frac{1}{4}$ mile on each side of the stream. There are approximately 4,000 acres in the scenic river corridor and 4,000 acres in the recreational river corridor. Portions of six streams segments are within other management areas but management practices permissible in these allocations will not preclude future inclusion of these river segments into the National Wild and Scenic River System under their identified classifications. Segment A of the St. Mary's River is the only stream identified as eligible under the wild classification. It is embedded in Management Area 8, Wilderness, which provides protection for the $\frac{1}{2}$ mile river corridor.

3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? No

b. Why? The 1993 Wild and Scenic River Eligibility Study was comprehensive. Since that time and to date, there are no known additional streams on the forest needing evaluation and there does not appear to be a need for a reevaluation of identified streams. Streams will remain in the eligible status until suitability studies and the associated site-specific analyses are conducted. Meanwhile, eligible stream corridors would be protected and their respective classifications retained as under the current plan.

5. Recommendations for Plan Revision

Identify the currently eligible stream segments with desired conditions and standards and guidelines that recognize the need to maintain these areas in conditions that do not affect their eligibility for further consideration as Wild, Scenic or Recreation Rivers.

C. Important Scenic and Recreational Areas

1. What was the Plan Striving For?



Mount Pleasant National Scenic Area

Though there is direction for aesthetic and recreation management in each Management Area of the 1993 Revised Forest Plan, several have scenery and/or recreation resources as primary resources. These include: MA 5, Massanutten Mountain; MA 6, the Appalachian National Scenic Trail; MA 7, Scenic Corridors and the Highlands Scenic Tour; MA 10, Scenic and Recreational Rivers; MA 12, Developed Recreation; and MA 13, Dispersed Recreation (42,000 acres in

numerous areas with heavy dispersed recreation use).

Additionally, MA 21, Special Management Areas is made up of 59,000 acres in four areas, Big Schloss, Laurel Fork, Little River, and Mount Pleasant. From the 1993 plan, *“These areas contain a variety of unique natural resources where a mixture of compatible management emphases is deemed the wisest management.”* Scenic and recreational resources are among the mixture.

2. Where is the Plan Now?

The scenic and recreation resources of these areas remain intact. The scenic and recreation resources of the forest remain to be protected, enhanced, and preserved. The Mount Pleasant National Scenic Area has received congressional designation since the plan was written.

3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? No

b. Why? The goal of protecting scenic or recreation purposes remains the same. Though individual areas may have changed status, (e.g., Mt. Pleasant) the management for scenery and/or recreation has not changed forestwide. There are no additional travelways to add to the list of scenic corridors.

5. What are the Consequences of Not Changing?

The scenic and recreation resources are protected without change.

6. Recommendations for Plan Revision

Include desired conditions and standards and guidelines for the scenic corridors identified in the current plan. Also retain identification of desired conditions and standards and guidelines for the heavily used dispersed recreation areas.

Issue Aesthetics



Lake Moomaw, James River Ranger District

1. What was the Plan Striving For?

The 1993 Revised Forest Plan used adopted Visual Quality Objectives (VQO) to preserve and enhance the scenic resources of the forest. The inventory VQOs were derived using the National Forest Landscape Management Visual Resource Management System (VMS). Using the inventory as a basis, every acre of

the forest was assigned an adopted VQO by management area. Adopted VQOs in the 1993 plan are more restrictive than the inventory VQOs. See the acreage table below.

For the 1993 plan, forest landscape architects updated and verified components of the VMS. All roads (Interstate, federal, state, and forest), major vistas, developed recreation sites, hiking trails, and viewing points were examined during leaf off to inventory seen areas on the forest. The public was invited to review the inventory and their input was used to refine the concern levels used in developing the final inventory VQOs. This inventory was then used in developing the adopted VQOs.

Table 3-14 (pages 3-119 through 3-121) of the 1993 plan presents contrast reducing standards used in vegetation management on the forest. Standards are given for different vegetation management activities based on the adopted VQO.

The 1993 plan went beyond the VMS direction and placed a great importance on constituent analysis.

2. Where is the Plan Now?

In 1995, after the 1993 Revised Plan was put in place, the Forest Service revised the VMS and renamed it Scenery Management System (SMS) A direct excerpt from the SMS handbook (USDA Handbook 701) explains,

The Scenery Management System evolved from and replaces the Visual Management System (VMS) as defined in Agricultural Handbook #462, while the essence of the system remains essentially intact, still supported by current research findings. Conceptually, the SMS differs from the VMS in that: it borrows from and is integrated with the basic concepts and terminology of Ecosystem Management. The SMS provides for improved

integration of aesthetics with other biological, physical, and social/cultural resources in the planning process

While the VMS has adopted visual quality objectives, the SMS has adopted scenic integrity objectives (SIO) for each management area to describe the desired future condition for managing the scenic resources of the forest. The table below shows 1993 plan inventoried and adopted VQOs by acreage. The equivalent Scenic Integrity Objectives (SIO) under the SMS is also given.

<u>Adopted Visual Quality Objectives</u>	<u>1993 Inventoried (Thousand Acres)</u>	<u>1993 Adopted (Thousand Acres)</u>	<u>Scenic Integrity Objectives</u>
Preservation	34	46	Very High
Retention	94	379	High
Partial Retention	279	548	Moderate
Modification	641	88	Low
Maximum Modification	12	0	Very Low

In addition to the five long-term VQOs on the left, the 1993 plan adopted two short-term VQOs, rehabilitation and enhancement, to be used as needed, though they are not assigned to any particular management areas. The SMS establishes scenic classes, a step that was not included in the VMS, although the components used to derive scenic classes were included in the VMS inventory process. The two components of scenic classes are landscape visibility and scenic attractiveness. Landscape visibility relates to concern levels and distance zones, and scenic attractiveness equates to variety class. The inventoried combination of viewing distance, concern level, and scenic attractiveness will produce seven scenic classes with classes 1 and 2 having high public value and classes 6 and 7 having low value. There is no need for a wholesale reinventory of the scenic resources of the GW, but public input may result in site specific review and/or change.

3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? The Scenery Management System is now used by the Forest Service in scenic resource management.

c. Tentative Options or Proposed Actions for ChangeC-1. The SMS is evolutionary rather than revolutionary from the VMS. Therefore, the inventoried distance zones, variety classes, and sensitivity levels are used in SMS. Convert the adopted visual quality objectives of the 1993 plan to scenic integrity objectives for the revised plan by using the inventory components, determine the scenic classes and then assign SIOs in the standards and guidelines that are both appropriate to the management emphasis of the prescription area and adequately protect the scenic resource .

C-2. Do nothing.

5. What are the Consequences of Not Changing?

The Scenery Management System is the national direction for managing scenic resources on national forests and is being adopted by most forests in the plan revision process. While not adopting the SMS will have no effect on the quality of the scenic resources of the GW National Forest, the forest will be behind in terminology and tools. Practically, the scenic resource will remain protected regardless of which system is used.

Proposed Action

Propose Option C1.

6. Recommendations for Plan Revision

Adopt the Scenery Management System to maintain the high level of emphasis on scenic quality across the Forest and remain current with direction provided in the Agriculture Handbook for Scenery Management.

Issue Vegetation Manipulation

1. What was the Plan Striving For?

The Revised Plan allowed for a combination of even-aged and uneven-aged regeneration harvest methods. It also provided management for wildlife species, but not as featured species. Instead, the Revised Plan emphasized habitat for the traditional 'featured species' in Management Areas 14, 15, 16 and 22 while monitoring and evaluating the effects of management practices through management indicator species. The Revised Plan provided for a forest environment with a wide variety of habitats to meet the needs of wildlife species inhabiting the Forest.

2. Where is the Plan Now?

See the discussion of timber harvest by harvest method under Issue 2. C. Allowable Sale Quantity. Also see the discussion of habitat management for wildlife under Issue Wildlife and the discussion of successional habitat in Issue Biodiversity.

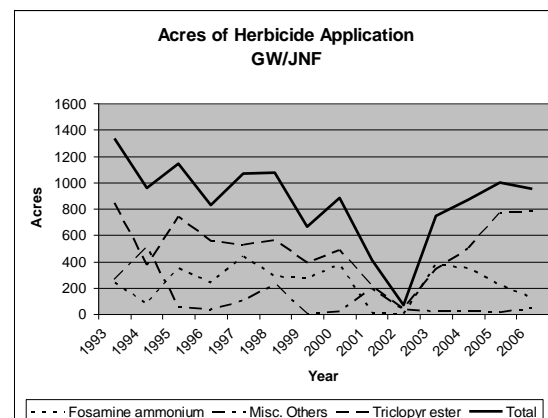
A. Herbicides

1. What was the Plan Striving For?

The Plan strove to safely utilize appropriate herbicides while avoiding significant adverse impacts to the human environment based on site-specific analysis (Plan, page 2-32).

2. Where is the Plan Now?

The graph shows the amount of land treated by herbicides over the combined George Washington and Jefferson National Forest. Figures for the GW alone are not available.



3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes, all herbicides applied were Class A herbicides as approved by the Environmental Protection Agency and the Regional Forester.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? No

b. Why? Herbicides are being used safely and conforming to appropriate State and Federal laws and policy.

5. Recommendations for Plan Revision

Utilize similar standards and guidelines as in the current plan to assure safe use of herbicides in management of vegetation.

Issue Minerals and Energy

A. Federal Minerals

1. What was the Plan Striving For?

The Revised Plan strived to continue to offer opportunities to explore and develop federal leasable minerals (energy minerals, such as natural gas, and non-energy minerals) and federal mineral materials on the Forest as one of the products important to the public (Plan page 2-33). In areas of high mineral resource potential, minerals were to be recognized as an important multiple use that may be developed in coordination with other resource values. Areas needing special protection (i.e. wilderness, recreation areas, etc.) either were to have minerals activities prohibited by law or restricted by timing, controlled surface use, or no surface occupancy stipulations according to the appropriate management area direction (Plan page 2-33). Furthermore, as existing oil and gas leases expire; new leases were to be issued under the standards of the appropriate management area (Plan page 2-33).

Federal oil and gas leasing was an issue in the development of the 1993 Revised Plan. Public involvement and environmental analysis (EIS) were considered in making the decision on what areas of the Forest would be available for federal oil and gas leasing, and under what condition or stipulation. In the EIS, the Forest examined withholding consent across the entire Forest (entire Forest unavailable for leasing). The Forest also examined withholding consent on various areas but found that Stipulations on leases could achieve similar protection of surface resources. Special Areas made available to lease under Controlled Surface Use Stipulation or No Surface Occupancy Stipulation have severe restrictions or prohibitions on ground disturbing activities. For example, the No Surface Occupancy Stipulation prohibits roads, well pads, and other ground disturbance on a lease, providing the same protection of surface resources as if consent to lease was withheld. It was also recognized that no ground disturbing activity could occur on any lease until a second environment analysis with public involvement was conducted for any site-specific proposal.

Although a large number of acres are 'available' for mineral activities, mineral deposits suitable for mining are scarce. Areas needed for mineral extraction are relatively small and isolated features on the vast acreage of the Forest. At most, only a very small percentage (less than 1%) of the Forest is expected to contain mineral activities.

2. Where is the Plan Now?

Federal leasable minerals

The Forest manages federal leasable minerals (energy minerals, such as natural gas, and non-energy minerals) in cooperation with the Bureau of Land Management (BLM), Department of Interior, which is the federal agency that issues federal energy and non-energy leases (36 CFR 288 B and E). Since 1993 the Forest has not received from BLM any requests for federal leases of non-energy minerals. From 1993 to 2006 no BLM-issued federal leases of non-energy minerals have been in effect on the Forest. Since 1993 natural gas has been the only leasable mineral on the Forest where there has been federal lease activity.

Federal oil and gas leasing on the Forest involves two levels of environmental analysis with public involvement and opportunities for public request for administrative reviews. The first environmental analysis with public involvement was the 1993 Forest Plan Revision EIS leading to the 1993 Forest Plan decision on the lands administratively available for leasing. The first administrative review was a Forest Service administrative review as a result of the 1993 Forest Service decision on lands administratively available for leasing. The second opportunity for administrative review is a BLM administrative review and occurs if and when BLM places any of these administratively available lands on a BLM public notice of competitive oil and gas lease. BLM places such lands on competitive lease sale in response to public nominations or expression of interest in leasing particular lands. This occurred in November 2007 when BLM placed on a competitive sale notice 4,802 acres on the Warm Springs Ranger District and 5,441 acres on the North River Ranger District. The public had the opportunity to request BLM administrative review of BLM's decision to offer these lands in the November 2, 2007 BLM public notice for lease.

No ground disturbance can occur on these existing leases or any future lease until the lessee submits an Application for Permit to Drill (APD) to the BLM, and a second environmental analysis with public involvement is conducted by the Forest Service and BLM. This second environmental analysis is site specific, focus on a specific proposal in a specific area of a specific lease. The Forest Service would review and approve the Surface Use Plan of Operations (SUPO). When the Forest Service makes its decision on the SUPO, and when BLM makes its decision on the APD, the public also has opportunity to request administrative reviews.

The fact that federal leases are issued does not automatically mean that any wells or road construction will be conducted on a lease. For example, during the oil and gas boom of the late 1970s and 1980s federal oil and gas leases were issued on hundreds of thousands of acres of George Washington National Forest. The result was a few

unsuccessful exploration wells were drilled that disturbed a few acres and were reclaimed. 99% of the leases expired with no ground disturbance.

Another reason for no ground disturbing activity on some federal leases can be because the drilling occurs on private land adjacent to federal land. Knowing how long it can take the federal government to process an APD and the wide range of environmental protections and restrictions on federal leases and APDs, some oil and gas operators may choose to drill on private land adjacent to federal leases.

The Laurel Fork Special Management Area became unavailable for future oil and gas leasing in a January 31, 1997 site-specific decision. Connected with this decision, the agency also withdrew consent to the Eastern States Office of the BLM to offer leases for oil and gas in the area. The Revised Plan was amended (Amendment #4) to be consistent with this decision. Federal gas wells in West Virginia are producing gas from a federal lease issued in 1952 in the Laurel Fork area. Wells drilled on a federal lease in West Virginia several decades ago showed this lease as well as the lease in Laurel Fork area was capable of gas production; but the leases did not produce because no pipeline was present. A gas pipeline was constructed in West Virginia in the 1990s. The gas pipeline allowed production from several federal gas wells in West Virginia near the Virginia state line as well as the lease in Laurel Fork area. No roads or wells are associated with the lease in Laurel Fork; it is drained by federal wells in West Virginia.

Since 1993 some seismic exploration was conducted and one natural gas exploratory well was drilled on a federal oil and gas lease in Highland County on the Warm Springs Ranger District. The exploration well drilled in 1997 did not discover commercial quantities of gas, and the well site was abandoned and reclaimed.

Oil and gas prices which were rising in recent years spiked upward in mid-2008 in the U.S. and around the world. In addition, there has been expression of interest in leasing in Hardy County and interest in the Marcellus shale (Devonian shale) as a potential source of natural gas in Virginia and West Virginia. Oil and gas prices dropped dramatically from mid-2008 to first quarter of 2009. Since 2008 the U.S. economy has slowed, and this has reduced demand for oil and gas. Interest in exploration and development for domestic energy sources, particularly oil and gas, can be expected to continue and may result in more oil and gas leasing on George Washington National Forest. However, the severe economic situation in the U.S. suggests reduced expectations or low level of potential oil and gas activity or any other mineral activity on federal mineral rights on the Forest. The Revised Forest Plan provides the direction for responding to requests to lease federal oil and gas by showing, by management area, which condition or stipulation would be applied.

Executive Order 13212 (Actions to Expedite Energy-Related Projects) of May 18, 2001 states “executive departments and agencies (agencies) shall take appropriate actions, to the extent consistent with applicable law, to expedite projects that will increase the production, transmission, or conservation of energy.” Executive Order 13212 requires that: “For energy-related projects, agencies shall expedite their review of permits or take other actions as necessary to accelerate the completion of such projects, while

maintaining safety, public health, and environmental protections.” Laws and environmental protections are still complied with, it is just that agencies are required to process energy projects diligently and not put energy projects off to the side and ignore these projects for months or years.

Federal mineral materials

Mineral materials include aggregate, landscaping rock, rip-rap, flagstone, and other rock or earth construction materials. Mineral materials are basic raw materials needed to construct and maintain Forest infrastructure. Every year the Forest uses mineral materials: to build and maintain trails, roads, campgrounds; to control erosion and sedimentation; to restore riparian and aquatic habitat; to reduce effects of acidic rain; to prevent or repair flood damage; etc. Most of the mineral materials used by the Forest are extracted from mines off the Forest, but some mineral materials are from small borrow pits on the Forest.

The Forest issues mineral material authorizations to the public and to state and county road departments. Congress gave the Forest Service authority to sell mineral materials to the public. Since 1993 the Forest each year has issued permits to the public for mineral materials, such as flagstone. Federal mineral materials are managed by the USDA Forest Service (36 CFR 228C), and are not the BLM-issued federal leasable minerals, such as oil and gas. The Forest can make mineral materials available as free use to governmental agencies.

3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? As changes are made in revising the plan we will likely need to update the oil and gas leasing availability. The Revised Plan continues to offer opportunities to explore and develop federal leasable minerals (energy minerals, such as natural gas, and non-energy minerals) and federal mineral materials while providing integration with and protection of surface resources. Furthermore, site-specific analysis on any ground-disturbing mineral activity must still occur.

B. Private Mineral Rights on Federal Lands

1. What was the Plan Striving For?

The Forest Plan provided brief mention of outstanding and reserved mineral rights. The Forest Plan recognized the existence of outstanding and reserved mineral rights with three Forest-wide Standards 151, 152, and 153 (Forest Plan page 3-140). These standards strived for basic administration of mining operations (including oil and gas drilling) in areas of outstanding and reserved mineral rights on the Forest.

The owners of the private mineral estates underlying the Forest possessed those rights before the Forest Service acquired the surface estate. The Forest Service acquisition of

the surface estate was subject to these valid existing mineral rights. These private mineral rights include the right of access and use of the surface to explore and develop the mineral estate. This section on private mineral rights does not deal with federal mineral rights or the private companies that lease federal oil and gas or other minerals; refer to section on federal minerals for discussion on federal leases.

2. Where is the Plan Now?

Mineral rights are privately-owned on 16 percent (approximately 167,000 acres) of the Forest. Of the privately-owned mineral rights, 76 percent are mineral rights outstanding to third parties, and 24 percent are mineral rights reserved by the grantor at the time of acquisition by the federal government.

Since 1993, an offer to sell private mineral rights under part of the National Forest is occasionally presented to the Forest Service. Because of other land acquisition priorities, the Forest Service generally has not pursued such offers. Thus, mineral rights remain privately-owned on 16 percent (approximately 167,000 acres) of the Forest.

Mining of shale on the Pedlar Ranger District in the 1980s was an operation under private mineral rights on National Forest System land. Reclamation of the shale mine on the Pedlar Ranger District is an operation under private mineral rights conducted under Plan implementation.

In 2005 the James River Ranger District received a proposal to exercise private mineral rights by mining. Forest Service requested additional information about the proposal, but has not received the information. To date, the proponent has not pursued the proposal with the Forest Service.

It is important to recognize that just because mineral rights are privately owned does not automatically mean that the mineral rights will be exercised to explore and develop minerals. In fact, the exercise of private mineral rights on the George Washington National Forest going back for decades is rare. As with federally-owned mineral estates, mineral deposits suitable for mining are scarce on privately-owned mineral estates on the George Washington National Forest. For example, there has never been a private mineral rights oil and gas well developed on the George Washington National Forest. Areas needed for mineral extraction are relatively small and isolated features on the vast acreage of the Forest. At most, only a very small percentage (less than 1%) of the Forest is expected to contain mineral activities. Since 1993 there has not been any ground disturbing operations to explore and develop any of the 167,000 acres of private mineral rights on the George Washington National Forest

3. Did Management Activities Move the Forest towards the Desired Future condition?

The Forest Plan has served adequately. Since 1993 there has not been any ground disturbing operations to explore and develop any of the 167,000 acres of private mineral rights on the George Washington National Forest

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? Over the past 20 years the Jefferson National Forest has experienced substantially more outstanding and reserved mineral rights operations, especially oil and gas operations, than the George Washington National Forest. Integration of private mineral rights with management area direction was an issue in the 2004 Revised Jefferson Forest Plan. The analysis showed that failure to consider private mineral rights under federal surface when allocating management areas could produce incompatible and conflicting land uses. The potential for conflict with the exercise of private mineral rights is particularly high where management activities are restrictive, such as in recommended wilderness study areas or inventoried roadless areas.

The George Washington Forest Plan could be improved by providing more consideration and integration of private mineral rights in the Plan and the Revision process. The 1993 Revised GWNF planning effort did not analyze the potential conflicts between management areas on federal surface and exercise of private mineral rights on federal surface to the degree analyzed in the Revised Jefferson Forest Plan completed in 2004. This reflects the fact that the Jefferson National Forest has more private mineral rights activity than the George Washington National Forest. However, as part of this Plan Revision it is prudent to apply some lessons learned from the Jefferson Plan Revision process regarding potential effects or conflicts relating to private mineral rights. Even though the exercise of private mineral rights on the George Washington National Forest has been rare, the potential to exercise private rights cannot be ignored, as even one operation can have substantial effects. Moreover, these private mineral rights have legal status as valid existing rights on the National Forest and need to be recognized and respected in the Forest Plan. There are two potential effects or conflicts relating to outstanding and reserved mineral rights:

- a) The potential effects of outstanding and reserved mineral operations on federal surface management (for example, potential for access roads and oil/gas wells pads in recommended wilderness study areas or inventoried roadless areas), and
- b) Potential effects of highly restrictive surface management direction on the exercise of outstanding and reserved mineral rights on the National Forest (for example, the potential for “taking” of private mineral rights due to federal action or inaction that prevents or unreasonably delays private mineral operations in recommended wilderness study areas or inventoried roadless areas).

The exercise of private mineral rights (reserved and outstanding) to explore and develop privately-owned minerals on NFS lands is a private decision, not a federal decision. Tens of thousands of acres of the George Washington National Forest System lands were acquired subject to these private mineral rights. Forest Plan direction needs to recognize and respect these existing private rights (outstanding and reserved mineral rights). It creates a challenging situation to manage public resources, but unless and until the government acquires these private rights, Forest management is subject to these valid existing rights.

Oil and gas prices which were rising in recent years spiked upward in mid-2008 in the U.S. and around the world. Then, oil and gas prices dropped dramatically from mid-2008 to first quarter of 2009. Since 2008 the U.S. economy has slowed, and this has reduced demand for oil and gas. Interest in exploration and development for domestic energy sources, particularly oil and gas, can be expected to continue and may bring requests to

exercise private mineral rights on the George Washington National Forest. However, the severe economic situation in the U.S. suggests reduced expectations or low level of potential oil and gas activity or any other mineral activity on private mineral rights on the Forest.

Additional rationale for the need for change for the GWNF Revised Forest Plan is contained in the following extended excerpt from the Jefferson NF Revised Forest Plan FEIS. The same rationale applies to the GWNF Revised Forest Plan.

The Jefferson NF Revised Forest Plan FEIS (p. 3-358, 3-359) noted:

A Comptroller General Report to Congress (GAO/RCED-84-101; July 26, 1984) found that the Forest Service in the eastern U.S. failed to provide Congress with information about private mineral rights and their potential effect on wilderness management. After designating many Wilderness areas in the eastern U.S., Congress was concerned about tens of millions of dollars that the Forest Service then said could be needed to acquire private mineral rights in several Wildernesses. The Forest Service was faced with management problems, litigation, and administrative costs, and was looking to Congress to purchase the private mineral rights. As the GAO noted: "Recent attempts by the federal government to acquire private mineral rights and prevent development in eastern wilderness areas have caused considerable controversy and congressional debate primarily because of the high costs associated with these purchases."

The GAO recommendation to the Secretary of Agriculture was: "Because the Forest Service did not analyze the potential problems or costs associated with private mineral rights when it developed its 1979 wilderness recommendations, GAO recommends that the Secretary direct the Forest Service's southern and eastern regional offices to do this type of analysis when reevaluating its wilderness recommendations. This analysis should include for each area consideration of private mineral development potential, the government's ability to control mineral development if it occurs, the need to acquire private mineral rights, and a range of acquisition costs."

These problems (management conflicts, litigation, and high costs) apply not only to Wilderness, but to 1) any highly restrictive surface use designation that conflicts with exercise of private mineral rights on National Forest System lands, and 2) management area direction that impose severe restrictions on use of the surface or prohibit certain activities such as road construction or mining. Examples include Special Biological Areas, Appalachian Trail Locations/Relocations, Wild & Scenic River designations, Wilderness Study Areas, or backcountry recreation areas. In 1997, the Jefferson National Forest spent more than \$300,000 to acquire private minerals interests and lands to shut down private sand mine deemed inappropriate near the Appalachian Trail in Smyth County. Currently the Jefferson National Forest is evaluating purchase of another private mineral interest in NFS land near the Appalachian Trail in Smyth County.

The 5th Amendment to the U.S. Constitution provides that private property shall not be taken for public use without just compensation. In addition to designation or direction that prohibit mining or are de facto prohibitions on mining, a "taking" can have other forms. For example, the time required to process private mineral activities under the Forest Plan's framework might result in unreasonable delays that amount to a "taking" of the mineral rights. Partial takings are also possible. Executive Order 12630

"Governmental Actions and Interference with Constitutionally Protected Property Rights" was signed in 1988. E.O. 12630 requires federal decision-makers to 1) evaluate carefully the effect of their administrative actions on private property rights, and 2) to show due regard to these 5th amendment rights and to reduce the risk of undue or inadvertent burdens on the federal treasury. Concern about government "takings" of private property rights is a national issue. In 1995, Congress held hearings on this issue.

c. Tentative Options or Proposed Actions for Change

- C-1. Recognize, consider and integrate outstanding and reserved mineral rights during the Forest Plan Revision process, such as in assessing suitability for Wilderness designation.
- C-2. Adopt a guideline such as: "Scoping for projects, including special designations, should determine whether reserved or outstanding mineral rights may affect or be affected by the proposed action."
- C-3. Adopt a guideline reflecting that review of proposed operations involves more than just riparian areas.
- C-4. Do nothing.

5. What are the Consequences of Not Changing?

The consequences of not changing is that the Revised Plan may create 1) unnecessary resource conflicts, 2) inability to achieve desired future conditions in some areas, 2) public controversies that could have been avoided, 3) situations ripe for "takings" of private mineral rights, 4) multi-million costs to federal government to avoid potential "takings", 5) another Congressional investigation and GAO report for not implementing the 1984 GAO recommendations regarding analysis of private mineral rights and the potential effect on National Forest management.

Proposed Action

Propose Option C1, C2, and C3.

6. Recommendations for Plan Revision

Consider outstanding and reserved mineral rights throughout the planning process. Adopt standards and guidelines to assure proper review of mineral rights during project implementation.

C. Wind Energy Development

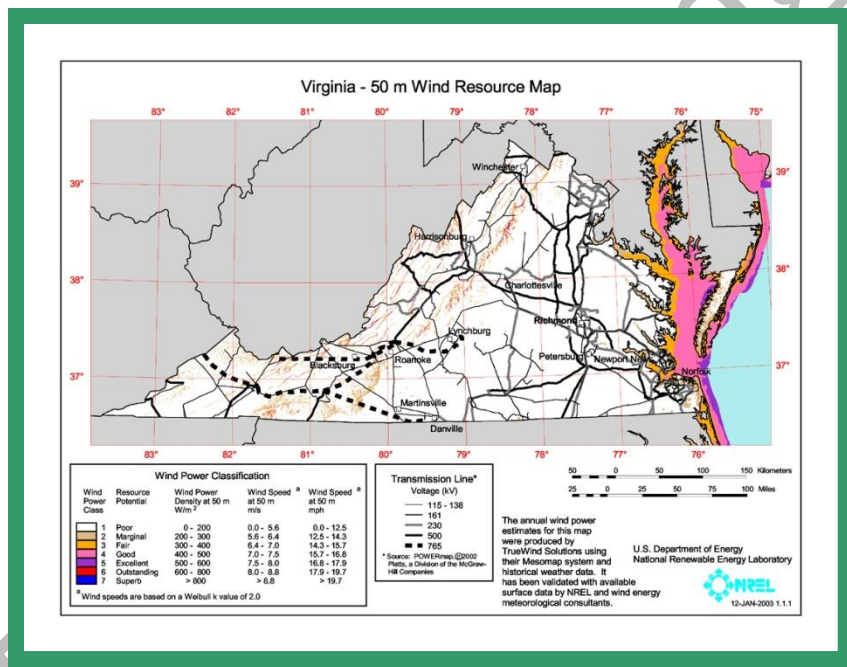
Highland County, Virginia approved a wind energy development on private land ridgeline in its county. Wind energy projects are being discussed in neighboring West Virginia Counties. The Virginia Counties of Rockbridge, Warren, and Nelson counties have discussions in their comprehensive plans on the protection of mountain ridgelines. Nelson County's policy is to "discourage ridgeline development". Warren County's objective is to develop standards for ridgeline development. Rockbridge County's strategy is to explore the potential for establishing a mountaintop development

ordinance, which would be designed to protect valuable ridgelines from future development using a threshold elevation.

Ridgeline development associated with wind energy development is not discussed in the George Washington 1993 Forest Plan.

This is an emerging public issue. Representatives of Virginia's environment groups first met with representatives of [Virginia's Wind Energy Collaborative](#) at James Madison University on [May 9, 2003](#). The [Virginia Wind Energy Collaborative \(VWEC\)](#) published a Model Small Wind Zoning Ordinance. The [Model Ordinance](#) is based on the ordinance adopted in October 2004 by Virginia's Rockingham County. VWEC and an Environmental Working Group had an Environmental GIS Wind Siting Tool Workshop on [April 21, 2005](#). The overriding issue regarding this topic is the potential for requests related to the development of commercial wind facilities on public lands. [Current Forest Service Policy](#) follows that developed by the Bureau of Land Management for consideration of such a request. The Forest Service designated a National Team to investigate this topic and develop guidance and requirements regarding commercial wind development on Forest Service Lands. Progress of this Team will be tracked and available information included in the Plan as it becomes available. In the mean time, BLM processes and procedures will be followed.

Map courtesy of [U.S. Dept. of Energy](#)



The Forest Plan's existing rural development desired condition (Plan, page 2-13) is still valid. The desired future condition involves continuing Forest contributions to the economic and social vitality of the Forest's neighbors. The Forest works with neighboring people and communities in developing natural-resource-based opportunities and enterprises within the

capabilities of the resources.

Commercial wind farms fall into the category of a special use of the National Forest. Forest Plan special use standard 236 states "Each new request is evaluated on a case-by-case basis for consistency with management area objectives and public need."

Guidelines for development of wind energy on land suitable could be developed based upon the best information and science available on the effects of wind farms on key environmental resources such as avian threatened, endangered, and sensitive species,

views from certain roads and trails, and other environmental considerations such as noise. Guidelines may need to focus on scale of development.

c. Tentative Options or Proposed Actions for Change

- C-1. Identify the Forest as suitable for locating wind energy development (commercial wind farms) outside of the following special areas: Wilderness or wilderness study areas; special botanical, zoological, geological, or research natural areas; Shenandoah Mountain Crest (Cow Knob Salamander Habitat); both Indiana Bat protection areas; Appalachian Trail corridor; remote backcountry areas; Mt. Pleasant National Recreation Area; and Big Schloss, Laurel Fork, and Little River Special Areas. The Forest is assuming that only Department of Energy wind power classes 3 or greater would be generally commercially feasible in these areas. In addition,
1. If and when an application is received and, during site-specific analysis, consider designating as a special area the wind energy site.
 2. For commercial scale requests, adopt as guidelines those guidelines developed by BLM, followed by any nationally Forest Service-developed guidelines. These will be incorporated into the planning process as they become available. Guidelines for development of wind energy on land suitable could be developed based upon the best information and science available on the effects of wind farms on key environmental resources such as avian threatened, endangered, and sensitive species, views from certain roads and trails, and other environmental considerations such as noise.
- C-2. Identify as suitable for locating wind energy development (commercial wind farms) the entire National Forest outside of Congressionally-designated areas. The Forest also recognizes that only Department of Energy wind power classes 3 or greater would be generally commercially feasible in these areas. In addition, the sub-options 1 and 2 would still pertain.
- C-3. Do not address in the Revision effort, acknowledging that agency does not know enough about this subject as it pertains to eastern United States. Agency would address through site-specific analysis as proposals are received.
- C-4. Identify that nowhere on the National Forest is suitable for wind energy development because of known effects on bats, particularly the Indiana bat (whose summer habitat is the entire Forest), until such time as wind energy technology exists that significantly lessens the known effects of the turbines on bats.

Proposed Action

Propose Option C1.

Recommendations for Plan Revision

Identify the following special areas as unsuitable for locating wind energy development (commercial wind farms): Wilderness or wilderness study areas; special botanical, zoological, geological, or research natural areas; Shenandoah Mountain Crest (Cow Knob Salamander Habitat); both Indiana Bat protection areas; Appalachian Trail corridor;

remote backcountry areas; Mt. Pleasant National Recreation Area; and Big Schloss, Laurel Fork, and Little River Special Areas. Proposals for wind energy development in other areas would be addressed following Agency policies for special use permits and any Agency policy specifically for wind energy development.

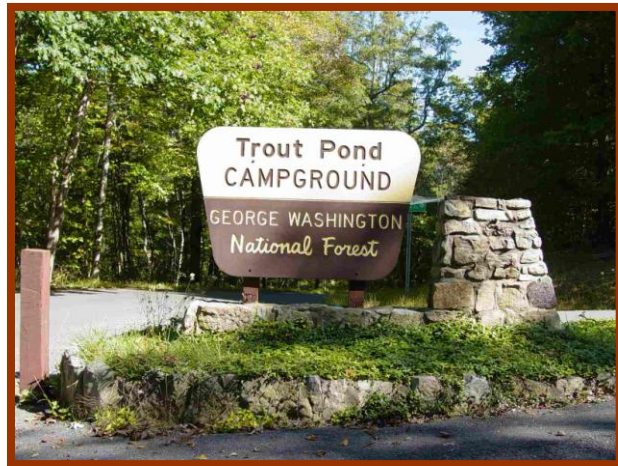
Issue Mix of Goods and Services

Developed Recreation in West Virginia

A. Developed Recreation

1. What was the Plan Striving For?

The 1993 Revised Forest Plan describes a developed recreation program (MA12) with facilities provided to: 1) protect the natural resources of the developed recreation sites, 2) provide for the safety of visitors, and 3) enhance the visitors' recreation experiences. Facilities range from minimally developed sites with emphasis on resource protection to highly developed recreation areas that provide facilities for visitor comfort and convenience. Several facility expansion and enhancement projects are called for, all to meet then current and projected demands. Another statement says that most developed recreation facilities are made accessible as funding allows. The 1993 vision of a balanced developed recreation program remains valid.



The Forest plan (pages 2-38 and 2-39; 3-61, 3-62, and 3-63) scheduled construction of 15 new developed recreation facilities and rehabilitation and expansion of 11 other facilities.

2. Where is the Plan Now?

Demand for developed recreation opportunities on the GWNF continues to grow as was projected in the 1993 plan, particularly at highly developed recreation sites such as Bolar Mountain and Sherando Lake. There has been good progress made in upgrading, replacing, and rehabilitating many recreation areas, yet few new or expansion facilities have been built. For instance, in recent years many replacement vault toilets have been installed, several highly developed toilet/shower buildings have been constructed, campsites have been reconstructed at campgrounds, and swim sites have been enhanced, all as called for in the 1993 Plan. All of the construction and rehabilitation was completed with accessibility for persons with disabilities included as a matter of course. But, there is a whole lot of work called for in the Plan that has not happened primarily due to funding shortfalls.

Under the plan, fifteen new developed recreation areas are called for as funding permits. The table below shows the status of construction of new facilities. Though intended as developed sites with toilets, water, and camping facilities, so-called dispersed camps are meant to accommodate horse users as well as hunters and other types of dispersed recreation users. Some such as Shaw's Fork and Oliver Mountain are site specific, and

others are for yet to be determined sites. Lacking funding and staffing, most were not accomplished. It is not that they are not good ideas; it is that money was better spent elsewhere.

Status of Construction of New Developed Recreation Areas

<u>Ranger District</u>	<u>Area Name</u>	<u>Status</u>
North River	Shaws Fork Dispersed Camp	Completed
	Dry River Dispersed Camp	No
	Dry River Rifle Range (VA)	No
James River	Oliver Mtn Dispersed Camp	No
	Highlands Scenic Tour	Completed
Lee	Bear Wallow Dev Campground	No
	Bucktail Dispersed Camp	No
	Edinburg Gap Dispersed Camp	Partially Complete
	Lee Rifle Range	No
Pedlar	Crabtree Meadows	New toilets only
	Pedlar Dispersed Camp	No
	Pedlar Rifle/Archery Ranges	No
	Environmental Education Center	Road Only
Warm Springs	Greavers Ridge Dispersed Camp	No
	Warm Springs Dispersed Camp	No

Under the plan several existing recreation areas are scheduled for expansion and/or rehabilitation as funding permits. This is meant to be more than just toilet replacement. It is intended to add capacity as well as upgraded facilities.

Status of Construction/Expansion at Existing Developed Recreation Areas

<u>Ranger District</u>	<u>Area Name</u>	<u>Status</u>
North River	Hone Quarry expansion/upgrade	New toilets only
	Braley Pond expansion	No
James River	Longdale expansion	No
	Morris Hill expansion	Incomplete
Lee	Elizabeth Furnace expansion	New campsites, vault toilets only
	Camp Roosevelt expansion	No
	Trout Pond expansion	No
Pedlar	Crabtree Falls Trail and Obs Point	Completed
	Sherando Lake expansion	No
Warm Springs	Bolar Mountain CG Conversion	Completed
	Hidden Valley expansion/upgrade	New vault toilets only
	Greenwood Point expansion	No
	Blowing Springs expansion/upgrade	New vault toilets only
	McClintic Point Camp	New vault toilet only

Since 1993, six minimally developed recreation areas have been closed and have been either abandoned or moth-balled, likely to never reopen. The ability of recreation managers to provide adequate maintenance and capacity has been reduced by funding and staffing cuts. Demand for these areas has not been great enough to warrant funding and personnel time for operations and maintenance. These areas include Reddish Knob

Hang Gliding, Shenandoah Mountain Picnic, Hazard Mill Family Camp, Hazard Mill and High Cliff Canoe Camps, and New Market Gap Picnic.

All new and altered facilities will be accessible to persons with disabilities to the extent called for in the Forest Service Outdoor Recreation Accessibility Guidelines (FSORAG) regardless of plan options selected for implementation

3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes, but at a slower pace than anticipated.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? The developed recreation program called for in the 1993 Forest Plan was good, but did not consider a realistic expectation of funding. There was a sharp decline in recreation funding in the early years of the new millennium. From 2002-2003, the George Washington National Forest conducted a Recreation Realignment, in accordance with direction from the Regional Office, to analyze use-specific and site-specific costs and benefits in order to make fiscally responsible decisions about recreation areas management. As a result, many actions were implemented from simply modifying opening and closing dates to actually closing visitor centers and stand-alone picnic areas and low use sites. In 2006, more than 100 part-time workers involved with the Senior Community Service Employment Program, who worked primarily in developed recreation, were transitioned to non-Forest Service assignments under new grantees, which resulted in reduced services at many recreation sites. To add insult to injury, fixed costs have risen substantially for supplies, trash collection, pumping vault toilets, utilities, mowing contracts, personnel and vehicles to transport personnel to recreation areas. Recreation fees were increased at six campgrounds on the George Washington National Forest in 2008, however the increased revenues did not keep pace with increased costs of operations and maintenance.

The next step for the Forest is to develop a portfolio of sustainable recreation facilities. It is believed that additional measures will be taken to reduce the development scale and/or reduce visitor services at moderate to low level developed recreation sites and limit the highly developed recreation areas to those that currently exist.

c. Tentative Options or Proposed Actions for Change

C-1. Do nothing but administrative corrections by revising the proposed facilities construction lists to reflect accomplishments and removing from the list areas that have been closed. Maintain the existing developed recreation program in the 1993 plan, with updates to reflect accomplishments and closings and with realization and acceptance that funding will be limited. The distinction of minimally developed and highly developed sites would remain.

C-2. Make an administrative change by removing the listings of individual developed recreation facilities. The developed recreation program for expansion and/or new construction will be dealt with by site specific analysis and completed only to the extent that funding and staffing levels allow. The Plan would continue to provide for a variety of development scales, from minimally to highly developed recreation sites.

5. What are the Consequences of Not Changing?

By not changing the plan, there will be no acknowledgement that funding levels are limiting and Forest Service personnel and recreation program resources are subject to unexpected and sometimes radical changes.

No hard consequences will result if changes are not made. Developed recreation facilities will be managed as funding allows. A quality program responsive to visitor needs is desired and intended either way.

The advantage of change in the plan is that the forest will maintain the issue of providing a quality developed recreation program to the extent practical. Managers acknowledge the visitor desires for developed recreation opportunities with site specific analysis. Knowledgeable management is more likely to be funded to provide a better developed recreation program.

Proposed Action

Propose Option C2.

6. Recommendations for Plan Revision

Remove the list of potential projects from the Plan desired condition. Acknowledge the desire to maintain and improve the existing developed recreation facilities. If new opportunities become available, address them through a site specific analysis.

B. Dispersed Recreation

1. What was the Plan Striving For?

The current GW plan recognized the importance of providing a variety of present and future dispersed recreation opportunities for the approximate 60 million residents within a day's drive of the forest. These opportunities include but are not limited to hunting, fishing, wildlife viewing, hiking, backpacking, camping, horseback riding, mountain biking, OHV use, driving for pleasure, and visiting historical sites. The Plan strove to meet demand for each of various Recreation Opportunity Spectrum (ROS) class settings as well as both motorized and non-motorized types of recreation. According to the EIS (page 3-34), as of 1993 the forest had ample land capacity to meet current and future demand for all the various ROS classes.

The GW Plan adopted six ROS classes to reflect the types of recreation opportunities and settings available on the forest. These six were: Rural, Roaded Modified, Roaded Natural, Semi-primitive Motorized – Subclass 1 (SPM1), Semi-primitive Motorized – Subclass 2 (SPM2) and Semi-primitive Nonmotorized (Plan Table 2-11, page 2-40).

Roaded Modified areas were differentiated from Roaded Natural areas solely on the basis of visual quality objectives (VQO). Roaded modified areas were to be managed to meet a modification VQO, while Roaded Natural areas were managed to meet the full range of VQOs except modification (FEIS, Appendix G, and page G-6.)

SPM1 and SPM2 areas were differentiated from each other based on whether roads built into an area were available for public motorized use. SPM1 areas were to be managed so that roads built could be open year-round, open seasonally, or closed year-

round depending on site-specific considerations. Conversely SPM2 areas were to be managed so that roads built into this area were not available for public motorized use (FEIS, Appendix G, page G-4 and G-5.)

A more thorough discussion of these six classes was discussed in Appendix G of the EIS.

2. Where is the Plan Now?

All management areas allowed for some form of dispersed recreation and the desired future condition for each included a discussion of the settings and types of opportunities that are consistent with the management area direction. Dispersed recreation was emphasized in MA5, Massanutten Mountain Sensitive Viewshed; MA6, Appalachian Trail; MA7, Scenic Corridors and the Highlands Scenic Tour; MA8, Wilderness/Wilderness Study; MA10, Scenic Rivers and Recreation Rivers; MA11 All-Terrain/Off Highway Vehicle Routes; MA13, Dispersed Recreation; MA 14 Remote Habitat for Wildlife, MA 15 Mosaic of Wildlife Habitat, MA16 Early Successional Habitat for Wildlife, MA21 Special Management Areas; and MA22 Habitat-Small Game/Watchable Wildlife. Forestwide and management area standards were designed to protect the environment from human caused impacts while providing recreation opportunities.

As of 1993 the Roaded Natural (RN) class comprised by far the largest percentage of the forest at 58%. This class provides the widest range of settings and opportunities since it tends to be amenable to both motorized and non-motorized forms of recreation. The Semi-Primitive Non-Motorized (SPNM) class, which restricts motorized recreation, comprised about 14% of the forest. Roaded Modified (RM)) which least restricts motorized recreation comprised approximately 8% of the forest.

While the Plan had six classes, the normal ROS inventory would have only four germane to the GW. The roaded modified is a subset of the Roaded Natural Class. Likewise the Semi-primitive Motorized, SPM1 and SPM2 are subsets of Semi-primitive Motorized class.

3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes, there did not seem to be any problems in managing the Forest under the adopted ROS concept. However, there is direction in the FEIS Appendix G that is not in the Plan regarding how roads built into SPM 1 and SPM2 areas are to be managed.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? The GW Plan is technically silent on the type of road (temporary, permanent, or both) that can be constructed and how it should be managed within adopted ROS class areas. The direction about road construction and management of SPM1 and SPM2 areas is in the FEIS and should be in the Plan. Furthermore, it may not be appropriate to have a differentiation from the SPM inventory to deal with how one aspect – roads – are managed.

The Plan's Roaded Modified distinction is not warranted. This is not a class that is provided in the Recreation Opportunity Spectrum. The protection of scenic quality is provided by assigned Scenic Integrity Objectives for every acre of Forest Service land that can be viewed from roads, trails, overlooks, and other viewing vantage points on, or

outside of, the national forest. The Scenery Management System contains direction on compatibility with ROS. Roaded Modified therefore serves no useful purpose and is redundant.

According to The Public Survey report, Southern Appalachian National Forests, 2002 (Cordell) 52% of respondents viewed wildlife/scenery, 52% drove for pleasure, 41% visited a wilderness and almost 34% hiked on the GW at least once that year. The other dispersed uses such as OHV use, fishing, biking, backpacking, and hunting are substantially lower but there is no statistical evidence or surveys indicated that demand for dispersed recreation in general is declining. Based on qualitative evidence from public contacts and volunteerism, equestrian and mountain bike use and interest is continuing to increase. Hiking and backpacking use fluctuates considerably based on seasonal weather conditions but appears to be remaining steady to increasing slightly. Hunting, by contrast, is evidently declining based on the drop in numbers of state hunting licenses issued over the past several years. This survey data confirms the need for providing a good mix of ROS classes while avoiding loss of opportunities for the activities tied to the more primitive/remote settings found primarily on the national forest.

For context, the most primitive class in the ROS system is Primitive (P). This class is characterized as being essentially unmodified; at least 5,000 acres in size and at least 3 mile from all roads, railroads or utility corridors. There are no Primitive (P) ROS class areas inventoried on the forest and there is little or none of it known to exist anywhere in the East. Thus the Semi-Primitive ROS classes (SPNM and SPM) are the most primitive to be found on the GW. These approximately 2,500 acre areas comprise roughly a third of the GWNF land area. While this is significant percentage of the forest, on a landscape scale these areas are scarce and comprise a very small percentage of the total land base (less than 2% of Virginia). The national forest is the primary provider of these types of settings and opportunities which are dependent upon land that is at least ½ mile from a better than primitive road to provide remoteness. Over time, the Semi-primitive classes will inevitably continue to shrink due to development on adjacent private lands. In addition, on the GW currently there is little protection in place against the increase in adjacent road construction which in turn would cause shrinkage of the semi-primitive ROS classes and their associated settings and opportunities.

While the GW Plan used six ROS classes for management of the recreation experience, the Jefferson Plan utilized four ROS classes: Roaded Natural, Semi-primitive Nonmotorized, Semi-primitive motorized (SPM) and a subset of SPM called Semi-primitive motorized 2 (SP2). The SP2 area was differentiated from SPM areas to provide a buffer to protect SPNM and SPM areas by allowing only temporary roads to be built within a ½ mile of an inventoried SPNM or SPM area. (Plan, page 2-42, standards FW-163 to FW-168) Thus both forests handled road construction and management differently and for different purposes.

c. Tentative Options or Proposed Actions for Change

- C-1. No change. Continue to use the existing GW Plan adopted ROS classes by applying them to identified areas of the Forest.

- C-2. Remove the SPM 1, SPM2, and Roaded Modified designations from the GW Plan, thereby collapse the GW ROS classes into the basic inventory classes; and provide suitable uses and associated guidelines on road construction and management by SPM and SPNM classes in the Plan.
- C-3. Complete a new inventory of ROS on the GW and adopt the inventory in place of the 1993 adopted ROS classes. Incorporate into plan direction a desire that the acres of SPNM and SPM will be maintained (where it is within our management control). This could be done with a guideline on road construction or using the SP2 Class concept from the Jefferson Plan. The SP2 Class concept creates a buffer area around SPNM and SPM areas where permanent road construction is limited to protect against loss of SPNM and SPM areas.

5. What are the Consequences of Not Changing?

Areas with SPNM and SPM opportunities have a potential for shrinking due to adjacent road construction and use on the Forest.

Proposed Action

There is no proposed action on this issue at this time.

Additional Information

The ROS classes were re-inventoried in 2009.

The following table displays the inventory from 1993, the acres adopted by class in the 1993 Forest Plan and the current inventory. Acres of RM were combined with RN for the Forest Plan adopted acres.

Acres of ROS Class			
ROS Class	1993 Inventory (Acres)	1993 Adopted (Acres)	2009 Inventory (Acres)
SPNM	167,000	150,000	198,266
SPM	203,000	208,000	211,000
RN	691,000	703,000	655,200

The ROS inventory shows that the semi-primitive class areas on the GW increased from 35 percent to 38 percent of the Forest from 1993 to 2009. The semi-primitive component of the GW is also substantially greater than that on the Jefferson NF (22 percent). So while the effects of development on adjacent lands have diminished some areas of semi-primitive opportunities, management activities on the National Forest have had minimal effects on semi-primitive opportunities.

c. Tentative Options or Proposed Actions for Change

- C-1. No change. Continue to use the existing GW Plan adopted ROS classes by applying them to identified areas of the Forest.

- C-2. Remove the SPM 1, SPM2, and Roaded Modified designations from the GW Plan, thereby collapsing the GW ROS classes into the basic inventory classes; and provide suitable uses and associated guidelines on road construction and management by ROS classes in the Plan.
- C-3. Remove the SPM 1, SPM2, and Roaded Modified designations from the GW Plan, thereby collapse the GW ROS classes into the basic inventory classes. In addition, use the new ROS inventory to help identify remote backcountry areas and evaluate potential wilderness areas. Additional standards or suitable use restrictions will not be identified. Any potential projects in the future that could affect the current ROS setting will be addressed through site specific project analysis.

6. Recommendations for Plan Revision Propose Option C-3.

C. Land Ownership

1. What was the Plan Striving For?

The Plan was striving for the consolidation of national forest ownership by exchange or acquisition with particular emphasis on acquiring desirable interior tracts, high value recreation lands, or threatened, endangered, and sensitive species' habitat.

The objectives are to have an exchange program of 100 acres per year and an acquisition program of 200 acres per year. The existing lands objectives do not reflect the reality of what can be accomplished under current National and Regional criteria and funding. (Plan Page 2-41, 2-42)

2. Where is the Plan Now?

The Plan goal has not changed. It is still striving for the consolidation of national forest ownership.

3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? A change is warranted because it is no longer feasible to accomplish the goals with the funding program, Land and Water Conservation Fund (LWCF) identified or in the time/acreage frames set in the Plan.

The land exchange program history shows that since 1993 in only two out of thirteen years was the 100 acre objective achieved or exceeded. The average for the exchange program was 34 ½ acres. The land acquisition program history shows that in only two of the years during the same period was the 200 acre goal achieved or exceeded. The average was 146 acres.

Trend in Land Acquisitions and Conveyances across the Combined Forests

<u>Year</u>	<u>Land Acquired Thru Exchange, Purchase or Donation (Acres)</u>	<u>Federal Land Conveyed Thru Selling or Exchanges (Acres)</u>	<u>Land Acquired Thru Exchange, Purchase or Donation (Acres)</u>	<u>Federal Land Conveyed Thru Selling or Exchanges (Acres)</u>	<u>Land Acquired Thru Exchange, Purchase or Donation (Total Acres)</u>	<u>Federal Land Conveyed Thru Selling or Exchanges (Acres)</u>	<u>Net Increase in National Forest System Land (Acres)</u>
Forest	GW	GW	Jefferson	Jefferson	GWJEFF	GWJEFF	
1987	296	-175	869	-132	1,165	-307	858
1988	4368	-130	885	-504	5,253	-634	4,619
1989	71	-212	524	-240	595	-452	143
1990	137	-376	0	0	137	-376	(239)
1991	83	-43	2058	-240	2,141	-283	1,858
1992	29	-23	1175	-293	1,204	-316	888
1993	167	-10	2011	-82	2,178	-92	2,086
1994	29	0	943	-370	972	-370	602
1995	192	0	3771	-46	3,963	-46	3,917
1996	76	0	1521	0	1,597	0	1,597
1997	35	-54	256	-444	291	-498	(207)
1998	95	0	1715	-34	1,810	-34	1,776
1999	772	-194	1039	-5	1,811	-199	1,612
2000	181	0	994	-99	1,175	-99	1,076
2001	210	-20	47	0	257	-20	237
2002	0	-170	381	-62	381	-232	149
2003	22	0	234	0	256	0	256
2004	0	0	1806	-54	1,806	-54	1,752
2005	120	-1	80	0	200	-1	199
2006	0	0	13	0	13	0	13
2007	14	25	0	5	14	30	44
						Grand Total	23,236

c. Tentative Options or Proposed Actions for Change

C-1. Modify the Forest Plan by:

- a) Making administrative correction by removing all reference to Land and Water Conservation Fund (LWCF) as the funding source for land acquisition since no funding is available for land acquisition.
- b) Deleting land program objectives for an exchange and acquisition program and replacing with language that states exchanges and acquisitions of land will be accomplished as funding is available

C-2. Do nothing.

5. What are the Consequences of Not Changing?

The changes will reflect that land managers are keeping abreast of changes in the program and are working toward realistic goals.

Proposed Action

Propose Option C1.

6. Recommendations for Plan Revision

Make the proposed changes.

D. Special Uses

1. What was the Plan Striving For?

The Plan was striving to minimize and or discourage the dedication of public land to a single private use. However, the plan did allow for special uses provided the uses were consistent with the objectives of the management area where the use was to be applied. Every use request was to be assessed to determine compatibility and compliance. (Plan Page 2-42)

2. Where is the Plan Now?

The Plan objective has not changed. It is still striving for minimizing the dedication of public land to a single private use.

3. Did Management Activities Move the Forest towards the Desired Future condition?

Yes

4. Is There a Need for Change?

- a. Is a Change in the Plan warranted? No
- b. Why? The objectives as stated in 1993 are still valid for the next planning period.

E. Grazing

1. What was the Plan Striving For?



The 1993 Revised Plan continues the current program of grazing on five allotments on 250 acres (Plan, page 2-42). Four allotments are located along the South Fork of the Shenandoah River (Moody, Whitting, Cullers, and Curl) and one is along Cedar Creek (Zepp Tannery) on the Lee Ranger District. Grazing is to be used to maintain a pastoral setting on lands historically grazed or

cultivated. (GW Plan Pg 3-130).

2. Where is the Plan Now?

Grazing continues on three of the five allotments; the Curl and Cullers allotments are no longer grazed. Lee District likes to have the presence of the permittee on these isolated tracts to discourage illegal use and traffic on these lands.

Even though the allotments are grazed to maintain the pastoral setting of these lands, impacts on soils and water are occurring. The Moody, Whitting, and Zepp Tannery allotments are currently being grazed with varying degrees of riparian protection or animal access to stream channels. The allotment on Cedar Creek has no controls to keep cattle from the creek. Otherwise, the other allotments have reasonable controls in place to limit cattle access to the South Fork of the Shenandoah.

3. Did Management Activities Move the Forest towards the Desired Future condition?

Pastoral settings are being maintained through grazing on three of the five allotments. While other the allotments (Curl and Cullers) are not being grazed, their pastoral setting is now being maintained by mowing or haying the fields.

4. Is There a Need for Change?

a. Is a Change in the Plan warranted? Yes

b. Why? Maintaining pastoral settings through grazing may not be appropriate on each of the five allotments. On the South Fork of the Shenandoah River, pastoral settings are common. However, Eastern Riverfront Hardwood communities (Bottomland Hardwoods) are not common. The JNF Plan (pages 3-170 and 3-178) recognizes the importance of this ecosystem, while the George Washington currently does not.

As a corollary, if pastoral settings is appropriate, and since cattle still have access to the streams for water, there is a need to strengthen the desired conditions and standards and guidelines under which grazing can occur. Utilizing just cattle to maintain a pastoral setting may not be appropriate. Currently the Curl tract's setting is maintained by mowing or haying. Utilizing cattle may conflict with trying to have intact riparian corridors and high water quality given that cattle have access to the stream/river water for drinking. Management of the allotments could become a model for other privately-managed farms in the valley.

Likewise, the NRCS is the leader in agricultural conservation in the United States and its [standard practices](#) on reducing effects from cattle grazing should be adopted by the Forest Service. NRCS can recommend appropriate practices for these allotments.

c. Tentative Options or Proposed Actions for Change

C-1. Remove pastoral settings and cattle grazing as a desired condition and replace the desired condition to be one of a bottomland hardwood forest along the South Fork of the Shenandoah River.

C-2. Change the desired condition to include having bottomland hardwood forest as well as pastoral setting (managed through grazing, burning, mowing, or hay fields), and bring any grazing program in line with the Jefferson Plan and Natural Resource Conservation Service (NRCS) practices by:

- a) Adopting as desired conditions and objectives Jefferson Plan Goal 28 and Objectives 28.01.
- b) Adopting Jefferson Plan Forestwide range standard FW-212.
- c) Adopting Jefferson Plan Management Prescription 7G (Pastoral Landscapes) desired condition statements as they pertain to pastoral settings and grazing.
- d) Adopting Jefferson riparian standards 11-38 through 11-40.
- e) Creating an objective that the existing four grazing allotment plans be revised over the next 10 years.

C-3. Do nothing. Leave pastoral settings and grazing as is in the Plan.

5. What are the Consequences of Not Changing?

Cattle will still graze and will still have access to the rivers and streams. The Forest would continue to attempt to remove cattle access to rivers and streams on a site-specific basis as funding permits.

Proposed Action

Propose Option C2.

6. Recommendations for Plan Revision

Include a desired condition for bottomland hardwood forest as well as pastoral setting (managed through grazing, burning, mowing, or hay fields) and bring any grazing program in line with the Jefferson Plan and Natural Resource Conservation Service (NRCS) practices by:

- a) Adopting as desired conditions and objectives Jefferson Plan Goal 28 and Objectives 28.01.
- b) Adopting Jefferson Plan Forestwide range standard FW-212.
- c) Adopting Jefferson Plan Management Prescription 7G (Pastoral Landscapes) desired condition statements as they pertain to pastoral settings and grazing.
- d) Adopting Jefferson riparian standards 11-38 through 11-40.
- e) Creating an objective that the existing four grazing allotment plans be revised over the next 10 years.

CHAPTER 5. ADDITIONAL ISSUES

A. Drinking Water

Many comments were received regarding the need to emphasize protection of water quality in watersheds that provide drinking water to downstream users. Resolutions

requesting that the Forest identify drinking water watersheds and develop direction to protect water quality in those watersheds were received from: Clarke County, Town of Timberville, Dayton Town Council, Warren County, Page County, Shenandoah Riverkeeper, Friends of the North Fork of the Shenandoah, Shenandoah Forum, Shenandoah Valley Network, Community Alliance for Preservation, Scenic 340 Project, Town of Amherst, Central Shenandoah Planning District Commission, Robert E. Lee Soil & Water Conservation District, Amherst County, Staunton City, Central Virginia Land Conservancy, Campbell County, and Bedford County. Wild Virginia prepared a document, *The State of Our Water: Managing and Protecting the Drinking Water Resources of the George Washington National Forest* that identified many drinking water watersheds and some recommendations for management.

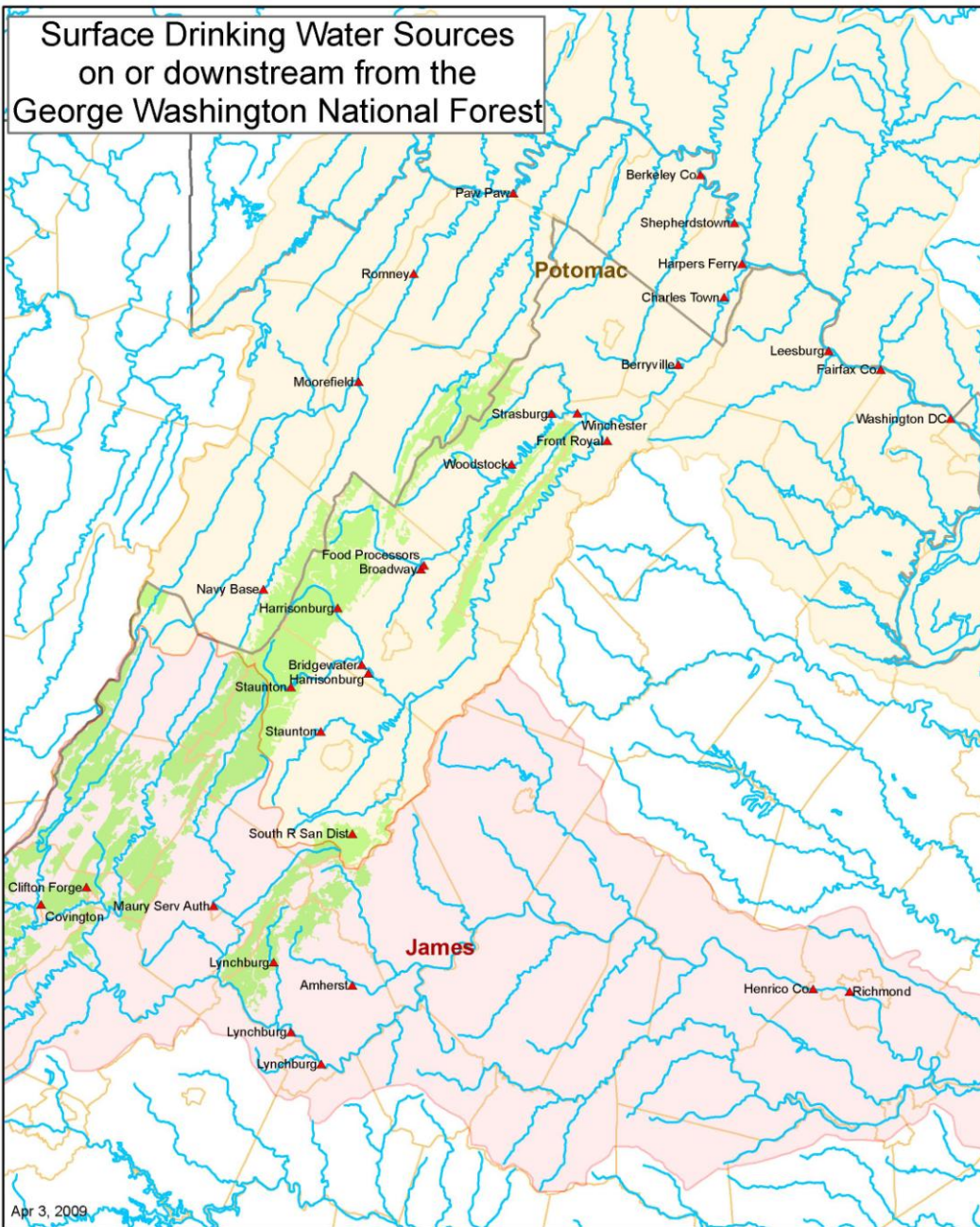
Water has been a key factor in National Forest Management since the creation of the National Forests and has been a key component of forest planning efforts on the GWNF (Cite 1960 plan) for over forty years. Proper management of water requires managing healthy forests throughout the watershed and taking appropriate management precautions in all activities. However, one of the main aspects of protecting water quality is managing the streams and the lands immediately adjacent to the streams – the riparian areas. (See the Riparian section of this document.) On the Forest we must provide water quality that is sufficient to support all of the aquatic life in our streams. Many of these plants and animals are very sensitive to water quality and we have a number of endangered and threatened aquatic species. Therefore, we have established guidelines that protect water quality for these species. By protecting them, we provide water quality of very high quality for drinking water sources.

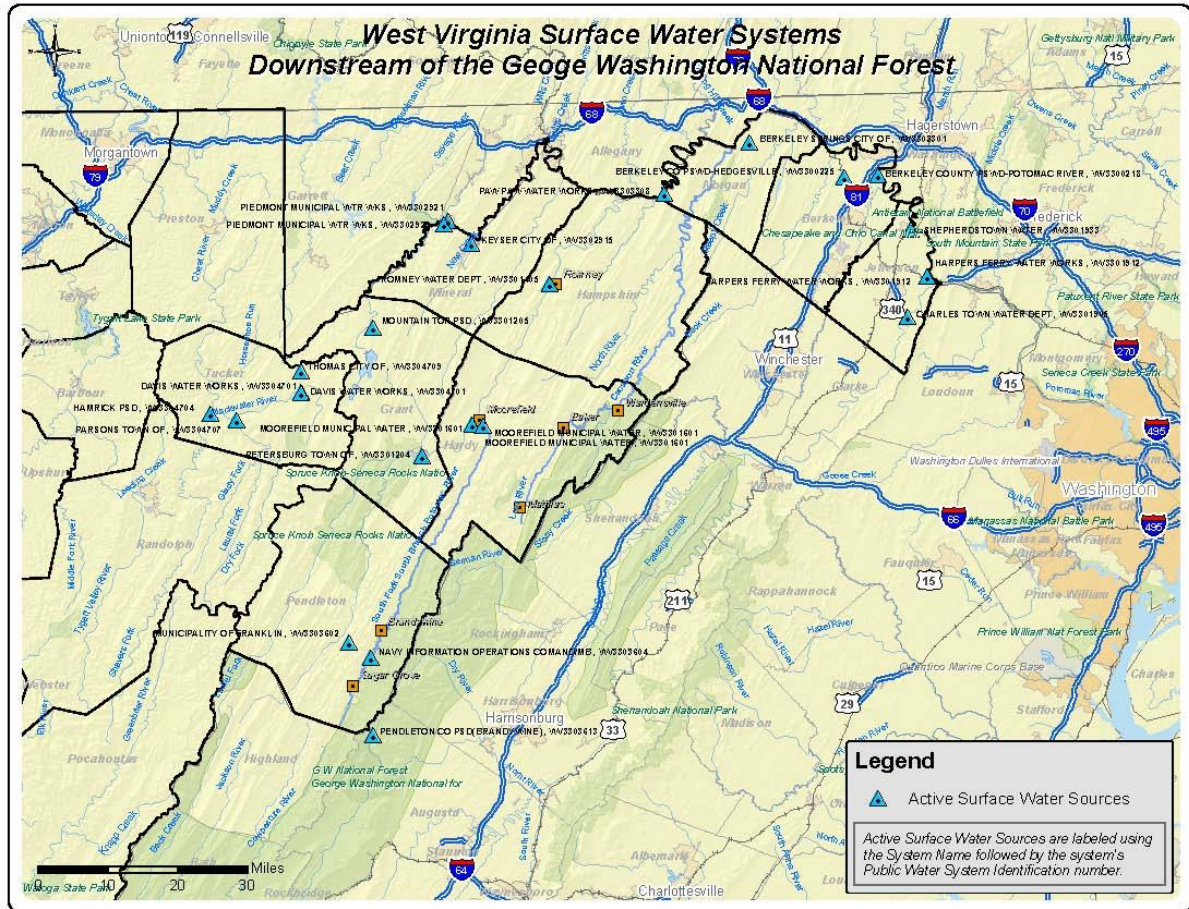
In the revised Plan we need to identify the drinking water supplies that depend on the National Forest. See Map and list of water supplies. In the strategy section of the revised Plan we can identify the importance of considering downstream uses in determining priorities for watershed improvement activities.

DRINKING WATER SUPPLIES WITHIN OR DOWNSTREAM OF GEORGE WASHINGTON NATIONAL FOREST

SYSTEM NAME	RIVER SYSTEM
LYNCHBURG, CITY OF	JAMES RIVER – COLLEGE HILL
LYNCHBURG, CITY OF	JAMES RIVER – ABERT
RICHMOND, CITY OF	JAMES RIVER
HENRICO COUNTY WATER SYSTEM	JAMES RIVER
AMHERST, TOWN OF	BUFFALO RIVER
JAMES RIVER CORRECTIONAL CTR	JAMES RIVER
LYNCHBURG, CITY OF	PEDLAR RESERVOIR
MAURY SERVICE AUTHORITY	MAURY RIVER
COVINGTON, CITY OF	JACKSON RIVER
CLIFTON FORGE, TOWN OF	SMITH CREEK
SOUTH RIVER SANITARY DISTRICT - ACSA	COLES RUN RESERVOIR
STAUNTON, CITY OF	NORTH RIVER DAM
HARRISONBURG, CITY OF	DRY RIVER – RIVEN ROCK
HARRISONBURG, CITY OF	NORTH RIVER
BRIDGEWATER, TOWN OF	NORTH RIVER

SYSTEM NAME	RIVER SYSTEM
BROADWAY, TOWN OF	NORTH FORK SHENANDOAH RIVER
FOOD PROCESSORS WATER COOPERATIVE, INC	NORTH FORK SHENANDOAH RIVER
WOODSTOCK, TOWN OF	NORTH FORK SHENANDOAH RIVER
FRONT ROYAL, TOWN OF	SOUTH FORK SHENANDOAH RIVER
WINCHESTER, CITY OF	NORTH FORK SHENANDOAH RIVER
STRASBURG, TOWN OF	NORTH FORK SHENANDOAH RIVER
FAIRFAX COUNTY WATER AUTHORITY	POTOMAC RIVER
BERRYVILLE, TOWN OF	SHENANDOAH RIVER
LEESBURG, TOWN OF	POTOMAC RIVER
BERKELEY COUNTY PSWD-POTOMAC RIVER	MAIN STEM POTOMAC RIVER
ROMNEY WATER DEPT	SOUTH BRANCH POTOMAC RIVER
MOOREFIELD MUNICIPAL WATER	SOUTH BRANCH POTOMAC RIVER AND SOUTH FORK OF THE SOUTH BRANCH POTOMAC RIVER
CHARLES TOWN WATER DEPT	SHENANDOAH RIVER
HARPERS FERRY WATER WORKS	MAIN STEM POTOMAC RIVER
SHEPHERDSTOWN WATER	MAIN STEM POTOMAC RIVER
PAW PAW WATER WORKS	MAIN STEM POTOMAC RIVER
NAVY INFORMATION OPERATIONS COMAND/MB	SOUTH FORK OF THE SOUTH BRANCH POTOMAC RIVER





B. Environmental Education

Many comments were received regarding the importance of providing environmental education opportunities on the Forest. While environmental education is not a plan component, it is important to highlight the need for more emphasis on environmental education and to acknowledge the tremendous opportunities that the Forest provides to meet the need to educate youth about the Forest's resources.

C. Climate Change

Please see the separate report addressing climate change, *Climate Change Trends and Strategies for the George Washington National Forest*.

REFERENCES

- Adams, MB. 1999. Acidic deposition and sustainable forest management in the central Appalachians. *Forest Ecology and Management* 122:17-28. PDF
- Adams, MB, JA Burger, AB Jenkins, and L Zelazny. 2000. Impact of harvesting and atmospheric pollution on nutrient depletion of eastern hardwood forests. *Forest Ecology and Management* 138: 301-319. PDF
- Adams, Paul W. and James R. Boyle, 1982, Soil Fertility Changes following Clearcut and Whole-tree Harvesting and Burning in Central Michigan, Published in Soil Sci Soc Am J 46:638-640 (1982).
- American Bird Conservancy. Early Successional Habitats in Eastern Deciduous Forests. Bird Conservation. Summer 2006, pp 10-11.
- American Chestnut Cooperators Foundation. [Http://accf-online.org](http://accf-online.org).
- Archey, W. 2000. A State Perspective, in Riparian Management in Forests of the Continental Eastern United States, edited by E. S. Verry, J. W. Hornbeck, and C.A. Dolloff. Lewis Publishers, CRC Press LLC, Washington D.C.
- Bailey, S. W., S. B. Horsley, and R. P. Long, Thirty Years of Change in Forest Soils of the Allegheny Plateau, Pennsylvania, SOIL SCI. SOC. AM. J., 2005, May-June; 69(3): 681-690.
- Belanger, Roger P., Barry F. Malac. 1980. Silviculture Can Reduce Losses from Southern Pine Beetle. Agriculture Handbook No. 576.; Swain, Kenneth M., Michael C. Remion. 1981. Direct Control methods for the Southern Pine Beetle. Agriculture handbook No. 575
- Benda, L., D. Miller, J. Sias, D. Martin, R. Bilby, C. Veldhuisen, T. Dunne. 2003. Wood recruitment processes and wood budgeting. Pages 49 – 74 in S. V. Gregory, K. L. Boyer, and A. M. Gurnell, editors. The ecology and management of wood in world rivers. American Fisheries Society, Symposium 37, Bethesda, Maryland.
- Bormann, F.H., Likens, G.E., 1979, Pattern and Process in a Forested Ecosystem, School of Forestry and Environmental Studies, Yale University, New Haven, CT, pub. Springer Verlag, New York, NY, 253 pp.
- Boyer, K., and D. Berg. 2003. Managing riparian and floodplain forests for large wood in rivers. In S. V. Gregory, K. L. Boyer, and A. M. Gurnell, editors. The ecology and management of wood in world rivers. American Fisheries Society,
- Boyle, Forbes M., Roy L. Hedden, and Thomas A. Waldrop. 2004. Impact of Prescribed Fire and Thinning on Host Resistance to the Southern Pine Beetle: Preliminary

Results of the National Fire and Fire Surrogate Study.. In: Proceedings of the 12th biennial southern silvicultural research conference. Gen. Tech. Rep. SRS-71. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 594 p.

Boyle, Steve and Stephanie Owens. 2007. North American Beaver (*Castor canadensis*): A Technical Conservation Assessment. Prepared for the USDA Forest Service, Rocky Mountain Region, Species Conservation Project. Montrose, CO.

Brown, Hutch. 2000. Wildland Burning by American Indians in Virginia. *Fire Management Today*, Volume 60, No. 3, Summer 2000. pgs 29-39.;

Brown, Hutch. 2004. Reports of American Indian Fire Use in the East. *Fire Management Today*, Volume 64, No. 3, Summer 2004. pgs 17-22.;

Buehler, D.A., Roth, A.M., Vallender, R., Will, T.C., Confer, J.L. Canterbury, R.A., Barker Swarthout, S., Rosenberg, K.V., and L.P. Bulluck. 2007. Status and Conservation Priorities of Golden-winged Warber in North America. *The Auk* 124(4):1439-1445. www.natureserve.org.

Bulger, A., J. Cosby, and R. Webb. 1998. Acid Rain: Current and Projected Status of Coldwater Fish Communities in the Southeastern US in the Context of Continued Acid Deposition. A Coldwater Conservation Fund Report for Trout Unlimited.

Bulluck, L.P. and D.A. Buehler. 2006. Avian use of early successional habitats: Are regenerating forests, utility right-of-ways and reclaimed surface mines the same? *Forest Ecology and Management* 236:76-84.

Collins, T.K. 2005. Geologic Hazards on National Forests. *Geo-Strata*. July/August. pp 31-34.

Connolly, S.J., T.C. Cain, J.S. Vestral and P.J. Edwards, The Potential Effects of Acid Deposition: What's a National Forest to Do?, M Furniss, C Clifton, and K Ronnenberg, eds., 2007. *Advancing the Fundamental Sciences: Proceedings of the Forest Service National Earth Sciences Conference, San Diego, CA, 18-22 October 2004*, PNWGTR-689, Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

Cordell, Ken et al. 2002. Public Survey Report Southern Appalachian National Forests George Washington and Jefferson National Forests. Public Use and Preferred Objectives for Southern Appalachian National Forests. 107 pp.

Crawford and Semlitsch 2006. Aquatic Habitats.

Cronan and Schofield, 1979; Aluminum Leaching Response to Acid Precipitation: Effects on High-Elevation Watersheds in the Northeast, *Science* 20 April 1979: Vol. 204. no. 4390, pp. 304 - 306

- Cronan, Christopher S., David F. Grigal, 1995, Use of Calcium/Aluminum Ratios as Indicators of Stress in Forest Ecosystems, Published in J Environ Qual 24:209-226 (1995).
- Crow, T., M. Baker, and B. Barnes. 2000. Diversity in Riparian Landscapes, in Riparian Management in Forests of the Continental Eastern United States, edited by E. S. Verry, J. W. Hornbeck, and C.A. Dolloff. Lewis Publishers, CRC Press LLC, Washington D.C.
- CWRP (Chargin Watershed River Partners, Inc.) and S. Schwartz. 2006. Riparian Setbacks: Technical Information for Decision Makers. Research support of
- Darci Houser, under award NA03NOS4190052 from the National Oceanic and Atmospheric Administration, U.S. Department of Commerce through the Ohio Department of Natural Resources, Office of Coastal Management. Original document 1997, revised 2006.
- Davis, Mary B., editor. 1996. Eastern Old-Growth Forests – Prospects for Rediscovery and Recovery. Washington, D.C.: Island Press. 383 pp.
- DeGraaf, R., and M. Yamasaki. 2000. Bird and Mammal Habitat in Riparian Areas, in Riparian Management in Forests of the Continental Eastern United States, edited by E. S. Verry, J. W. Hornbeck, and C.A. Dolloff. Lewis Publishers, CRC Press LLC, Washington D.C.
- Dolloff, C. A., D. G. Hankin, and G. H. Reeves. 1993. Basinwide estimation of habitat and fish populations in streams. General Technical Report SE-83. Asheville, North Carolina: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment
- Dolloff, C. A., and J. Webster. 2000. Particulate Organic Contributions from Forests and Streams: Debris Isn't So Bad, in Riparian Management in Forests of the Continental Eastern United States, edited by E. S. Verry, J. W. Hornbeck, and C.A. Dolloff. Lewis Publishers, CRC Press LLC, Washington D.C.
- Dolloff, C. A. and M. L. Warren, Jr. 2003. Fish relationships with large wood in small streams. Pages 179-193 in S. V. Gregory, K. L. Boyer, and A. M. Gurnell, editors. The ecology and management of wood in world rivers. American Fisheries Society, Symposium 37, Bethesda, Maryland.
- Dombeck, M. 1999. The United States Forest Service: The World's Largest Water Company. Outdoor Writers Association of America Conference, Sioux Falls, South Dakota, June 21.
- Driscoll, CT, GB Lawrence, AJ Bulger, T Butler, CS Cronan, C Eagar, KF Lambert, GE Likens, JL Stoddard, and KC Weathers. 2001. Acidic deposition in the northeastern

US: sources and inputs, ecosystem effects, and management strategies. *BioScience* 51:180-198. *PDF*

Duncan, S. 2003. Arise Amphibians: Stream buffers affect more than fish. Pacific Northwest Research Station, Science Findings. Issue 53, May 2003.

Elliott, Katherine, J., Jennifer D. Knoepp, 2005, The effects of three regeneration harvest methods on plant diversity and soil characteristics in the southern Appalachians, *Forest Ecology and Management* 211 (2005) 296–317.

Fox, T.R., 2000, Sustained productivity in intensively managed forest plantations, *Forest Ecology and Management* 138 (2000) 187-202

Franklin, A.B., Noon, B.R., and T.L. George. What is Habitat Fragmentation? 2002. *Studies in Avian Biology* No. 25:20-29.

Freedman, B., 1990, Nutrient removals during forest harvesting: implications for site fertility, Department of Biology and School for Resources and Environmental Studies, Dalhousie University, Halifax, Nova Scotia, Canada; Publication n° 19, novembre, 1991, réédité par Le Groupe de Coordination sur les Bois Raméaux Département des Sciences du Bois et de la Forêt Faculté de Foresterie et de Géomatique Université Laval Québec G1K 7P4 QUÉBEC Canada.

George Washington and Jefferson National Forests Detailed Monitoring and Evaluation Report for Fiscal Year 2004, September 2005

Gibson, R., R. Haedrich, and C. M. Wernerheim. 2000. Loss of Fish Habitat as a Consequence of Inappropriately Constructed Stream Crossings. *Fisheries*. Vol. 30, No. 1.

Gordon, A.G., 1983, Nutrient Cycling dynamics in Differing Spruce and Mixed wood Ecosystems in Ontario and the Effects of Nutrient Removals Through Harvesting, in *Resources and Dynamics of the Boreal Zone*, pp 97-118, Ontario Tree Improvement and Forest Biomass Institute, Ontario Ministry of Natural Resources, Sault St. Marie, Ontario, Canada

Gottschalk, Kurt W. 1993 *Silvicultural Guidelines for Forest Stands Threatened by the Gypsy Moth*. Northeastern Forest Experiment Station General Technical Report NE-171.

Grossman, D.H. et al. 1998. *International Classification of Ecological Communities: Terrestrial Vegetation of the United States*. Volume 1. The National Vegetation Classification System: Development, Status, and Applications. The Nature Conservancy, Arlington, VA. <http://www.natureserve.org/library/vol1.pdf>

- Gunther, R., C.P. Kilgore, and R. Rupprecht. 2008. Riparian and Wetland Buffers: A Review of Current Literature, with Recommendations for Determining Widths for Providing Certain Ecosystem Services. American Water Resource Association, Summer Specialty Conference, Virginia Beach, June 30-July 2.
- Hajek, Ann E. 1996. *Entomophagia maimaiga*: A Fungal Pathogen of Gypsy Moth in the Limelight. In: Proceedings of Cornell Community Conference on Biological Control.
- Hankin, D. G., and G. H. Reeves. 1988. Estimating total fish abundance and total habitat area in small streams based on visual estimation methods. *Canadian Journal of Fisheries and Aquatic Sciences* 45:834-844.
- Hilderbrand, R. H., A. D. Lemly, C. A. Dolloff, and K. L. Harpster. 1998. Design considerations for large woody debris placement in stream enhancement projects. *North American Journal of Fisheries Management* 18:161-167.
- Hornbeck, J., and J. Kochenderfer. 2000. Linkages Between Forests and Streams: A Perspective in Time, in Riparian Management in Forests of the Continental Eastern United States, edited by E. S. Verry, J. W. Hornbeck, and C.A. Dolloff. Lewis Publishers, CRC Press LLC, Washington D.C.
- Huntington, T.G., R.P. Hooper, C.E. Johnson, B.T. Aulenbach, R. Cappellato and A.E. Blum, 2000, Calcium Depletion in a Southeastern United States Forest Ecosystem, *Soil Science Society of America Journal* 64:1845-1858 (2000).
- Illhart, B., E. Verry, and B. Palik. 2000. Defining Riparian Areas, in Riparian Management in Forests of the Continental Eastern United States, edited by E. S. Verry, J. W. Hornbeck, and C.A. Dolloff. Lewis Publishers, CRC Press LLC, Washington D.C.
- Ivasauskas, T. J, C. Kyger, and C. N. Roghair. 2006. Stream Habitat Conditions in the North River, Dry River Ranger District, George Washington-Jefferson National Forest, VA, 2005. Unpublished file report. Blacksburg, Virginia: U.S. Department of Agri.
- Ivasauskas, T. J, C. Kyger, and C. N. Roghair. 2006. Condition of Selected Streams in the Warm Springs Ranger District, George Washington-Jefferson National Forest, VA, 2005. Unpublished file report. Blacksburg, Virginia: U.S. Department of Agriculture,
- Jacobson, R.B. et al. 1989. The Role of Catastrophic Geomorphic Events in Central Appalachian Landscape Evolution. *Geomorphology* 2:257-284.
- Jenkins, A.B., Sencindiver, J.C. Bhumba, D.K., 1998. Biogeochemical relationships of calcium and magnesium in high elevation forest soils of West Virginia. *Agronomy Abstracts*.
- Johnson, D. W., D. C. West, D. E. Todd and L. K. Mann, 1982, Effects of Sawlog vs. Whole-Tree Harvesting on the Nitrogen, Phosphorus, Potassium, and Calcium

Budgets of an Upland Mixed Oak Forest, Published in Soil Sci Soc Am J 46:1304-1309 (1982).

Johnson, D.W., Todd, D.E., 1998. Harvesting effects on long-term changes in nutrient pool of mixed oak forest. Soil Science Society of America Journal. 62, 1725-1735.

Johnson, James E., David Wm. Smith, James A. Burger, 1985, Effects on the Forest Floor of Whole-Tree Harvesting in an Appalachian Oak Forest, American Midland Naturalist, Vol. 114, No. 1 (Jul., 1985), pp. 51-61.

Kappesser, G. 1999. The Importance Of Large Woody Debris Recruitment To Intermittent Stream Channels For Watershed Dynamic Equilibrium. US Forest Service White Paper, August 4.

Knoepp, J.D., and Swank, W.T., 1997. Long-term effects of commercial sawlog harvest on soil cation concentrations. Forest Ecology and Management. 93, 1-7.

Kyger, C., T. Ivasauskus, and C. N. Roghair. 2005. Comparison of Stream Habitat Conditions on the Pedlar Ranger District, George Washington-Jefferson National Forest 1995 vs. 2005. Unpublished file report. Blacksburg, Virginia: U.S. Department of Agri,

Lee, P., C. Smith, and S. Boutin. 2004. Quantitative review of riparian buffer width guidelines from Canada and the United States. Journal of Environmental Management, 70, 165-180.

Lessing, Peter, Byron R. Kulander, and Stuart L. Dean, GEOLOGY AND KARST OF TROUT POND RECREATION AREA, HARDY COUNTY, WEST VIRGINIA, West Virginia Geological and Economic Survey, June 1997: 19 pages.

Lovett, G.M., and T.H. Tear. 2008. Threats from Above: Air Pollution Impacts on Ecosystems and Biological Diversity in the Eastern United States. The Nature Conservancy and the Cary Institute of Ecosystem Studies.

Lynch, Jason A., and James S. Clark. 1999. Long-Term Vegetation and Fire Histories at Spring Pond, Virginia. In The Big Levels Region of Virginia – Proceedings of a Symposium. Banisteria, Number 13, pg 209.

Lynch, Jason A. and James S. Clark. 2002. Fire and Vegetation Histories in the Southern Appalachian Mountains: The Historical Importance of Fire Before and After European/American Settlement. Report submitted to the George Washington and Jefferson National Forests.

Maliondo, S.M., 1988, Possible effects of intensive harvesting on continuous productivity of forest lands, Information Report M. X. Maritimes Forest Research Centre, Canadian Forestry Service.

- Maliondo, S.M., Mahendrappa, M.K., 1990, Distribution of Biomass and Nutrients in Some New Brunswick Forest Stands: Possible Implications of Whole-Tree Harvesting, Information Report Forestry Canada Maritimes Region (MX170E/F: 40 pp.
- Marion, G.M., 1979, Biomass and Nutrient Removal in Long-Rotation Stands, in Proceedings: Impact of Intensive Harvesting on Forest Nutrient Cycling, 1979, 98-110, State University of New York, College of Environmental Science and Forestry.
- Mason, Garland N., Kurt W. Gottschalk, James S. Hadfield 1989. Effects of Timber management Practices on Insects and Diseases In: The Scientific basis for Silvicultural and Management Decisions in the national Forest System. Gen. Tech. Rep. WO-55. Washington, DC: U.S. Department of Agriculture, Forest Service, 180 p.
- Mates, W.J. and J.L. Reyes. 2006. The Economic Value of New Jersey State Parks and Forests, New Jersey Department of Environmental Protection Division of Science, Research & Technology, Issued June 2004, Revised version issued November 2006.
- Mayer, P., S. Reynolds Jr., T. Canfield, and M. McCutchen. 2005. Riparian Buffer Width, Vegetative Cover, and Nitrogen Removal Effectiveness: A Review of Current Science and Regulations. U.S. Environmental Protection Agency, National Risk Management Research Laboratory, Office of Research and Development, Cincinnati, Ohio. EPA/600/R-05/118.
- Montgomery, D. R., B. D. Collins, J. M. Buffington, T. B. Abbe. 2003. Geomorphic effects of wood in rivers. Pages 21 – 48 in S. V. Gregory, K. L. Boyer, and A. M. Gurnell, editors. The ecology and management of wood in world rivers. American Fisheries Society, Symposium 37, Bethesda, Maryland.
- Morgan, B.A. et al. 1997. Debris-Flow Hazards in Areas Affected by the June 27, 1995 Storm in Madison County, Virginia. USGS Open File Report 97-438.
- Morris, A.E.L, P.C. Goebel¹ and B.J. Palik. 2007. Geomorphic and riparian forest influences on characteristics of large wood and large-wood jams in old-growth and second-growth forests in Northern Michigan, USA Large-wood jams of second-growth and old-g
- Morrison, I.K., Foster, N.W., 1979, Biomass and Element Removal by Complete-Tree Harvesting of Medium Rotation Forest Stands, in Proceedings: Impact of Intensive Harvesting on Forest Nutrient Cycling, 1979, 111-129, State University of New York, College of Environmental Science and Forestry.
- NatureServe Explorer: An online encyclopedia of life [web application]. 2009. Version 7.1 Available: <<http://www.natureserve.org/explorer>>.
- Noble, R. 2002. Reflections on 25 years of progress in black bass management. Pages 419-431 in D. P. Philipp and M. S. Ridgway, editors. Black Bass: Ecology,

Conservation, and Management. American Fisheries Society, Symposium 31, Bethesda, Maryland.

Oak, Steven W., et. al. 2004. In: Spetich, Martin A., ed. 2004. Upland oak ecology symposium: history, current conditions, and sustainability. Gen. Tech. Rep. SRS-73. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 311 p

Oak, Steven W., Cindy M. Huber, Raymond M. Sheffield. 1991. Incidence and Impact of Oak Decline in Western Virginia, 1986. Southeastern Forest Experiment Station Resource Bulletin SE-123

Palik, B., J. Zasada, and C. Hedman. 2000. Ecological Principles for Riparian Silviculture, in Riparian Management in Forests of the Continental Eastern United States, edited by E. S. Verry, J. W. Hornbeck, and C.A. Dolloff. Lewis Publishers, CRC Press LLC, Washington D.C.

Parrott, H., C. Edwards, and D. Higgins. 2000. Classifying Aquatic Ecosystems and Mapping Riparian Areas, in Riparian Management in Forests of the Continental Eastern United States, edited by E. S. Verry, J. W. Hornbeck, and C.A. Dolloff. Lewis Publishers, CRC Press LLC, Washington D.C.

Patterson III, William A. and Andrea Stevens. 1995. The History of Fire and Vegetation in the Appalachian Mountain Region of Virginia: A Piece of the Puzzle We Call Ecosystem Management. Report Submitted to the George Washington National Forest. Harrisonb

Patterson III, William A. The Paleoecology of Fire and Oaks in Eastern Forests. In Fire in Eastern Oak Forests: Delivering Science to Land Managers. Proceedings of a Conference. Northern Research Station, GTR-NRS-P-1. pgs 2-19.

Pauley, T., J. Mitchell, R. Buech, and J. Moriarty. 2000. Ecology and Management of Riparian Habitats for Amphibians and Reptiles, in Riparian Management in Forests of the Continental Eastern United States, edited by E. S. Verry, J. W. Hornbeck, and C.A. Dolloff. Lewis Publishers, CRC Press LLC, Washington D.C.

Perala, D.A., Alban, D.H., 1982, Rates of Forest Floor Decomposition and Nutrient Turnover in Aspen, Pine, and Spruce Stands on Two Soils, Research Paper, North Central Forest Experiment Station, USDA Forest Service, (NC-227, 5pp, St. Paul, MN.

Quinn, S. 2002. Status of seasonal restrictions on black bass fisheries in Canada and the United States. Pages 455-465 in D. P. Philipp and M. S. Ridgway, editors. Black Bass: Ecology, Conservation, and Management. American Fisheries Society, Symposium

- Reich, M., J.L. Kershner, and R.C. Wildman. 2003. Restoring streams with large wood: a synthesis. Pages xx-xx in S. V. Gregory, K. L. Boyer, and A. M. Gurnell, editors. The ecology and management of wood in world rivers. American Fisheries Society, Symp
- Richards, C. and B. Hollingsworth. 2000. Managing Riparian Areas for Fish, in Riparian Management in Forests of the Continental Eastern United States, edited by E. S. Verry, J. W. Hornbeck, and C.A. Dolloff. Lewis Publishers, CRC Press LLC, Washington D.C.
- Rose, Anita K. 2001 Virginia's Forests, 2001 Southern Research Station Resource Bulletin SRS-120
- Sauer, J. R., J. E. Hines, and J. Fallon. 2008. The North American Breeding Bird Survey, Results and Analysis 1966
- Scott, D. Andrew, John Novosad and Gala Goldsmith, 2004, Ten-Year Results from the North American Long-Term Soil Productivity Study in the Western Gulf Coastal Plain; Furniss, M , C Clifton, and K Ronnenberg, eds., 2007. *Advancing the Fundamental Sciences: Proceedings of the Forest Service National Earth Sciences Conference, San Diego, CA, 18-22 October 2004*, PNWGTR-689, Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.
- Semlitsch and Bodie 2003 Aquatic Habitat.
- Silkworth, D.R., Grigal, D.F., 1982, Determining and Evaluating Nutrient Losses Following Whole-Tree Harvesting of Aspen, Soil Science Society of America Journal, 1982;46(3): 626-631.
- Southern Appalachian Mountain Initiative (SAMI). 2002. Odman et al. SAMI Air Quality Modeling Final Report.
- Sponaugle, C., J. Skousen, P. Edwards, S. Connolly, and J. Sencindiver, Properties and Acid Risk Assessment of Soils in Two Parts of the Cherry River Watershed, West Virginia, Contribution of the West Virginia Agricultural and Forestry Experiment Station, Article # Spotte, S. 2007. Bluegills: biology and behavior. American Fisheries Society, Bethesda, Maryland.
- Straughan Environmental Services, Inc. 2003. Riparian Buffer Effectiveness Literature Review. Prepared for Maryland Department of Natural Resources, Power Plant Research Program, Annapolis, Maryland.
- Swain, Kenneth M., Michael C. Remion. 1981. Direct Control methods for the Southern Pine Beetle. Agriculture handbook No. 574
- Sweeney, B., T. Bott, J. Jackson, L. Kaplan, J.D. Newbold, L. Standley, W.C. Hession, and R. Horwitz. 2004. Riparian deforestation, stream narrowing, and loss of stream

ecosystem services. Stroud Water Research Center. Proceedings of the National Academy of Sciences, 101:39, 14132-14137.

Swenson, W. 2002. Demographic changes in a largemouth bass population following closure of the fishery. Pages 627-637 in D. P. Philipp and M. S. Ridgway, editors. Black Bass: Ecology, Conservation, and Management. American Fisheries Society, Symposium

Thatcher, Robert C., et al. 1980. The Southern Pine Beetle. Technical Bulletin 1631 55. Washington, DC: U.S. Department of Agriculture, Forest Service, 265 p.

Timmer, V.R., Savinsky, H.M., Marek, I.R., 1983, Impact of Intensive Harvesting on Nutrient Budgets of Boreal Forest Lands in Resources and Dynamics of the Boreal Zone, 131-147, Ottawa, Canada: Association of Canadian Universities for Northern Studies, Conference Paper.

Tiner, R.W. 1999. Restoring Wetland and Streamside/Riparian Buffers: An Introduction. USDI Fish and Wildlife Service. Hadley, MA.

Trombulak, S. C. 1996. The Restoration of Old Growth: Why and How. In: Davis, M.B. Eastern old-growth forests: Prospects for rediscovery and recovery. Washington, D.C.: Island Press: 305-320.

Turner, R.S., Olson, R.J., Brandt, C.C., 1986. Areas having soil characteristics that may indicate sensitivity to acidic deposition under alternative forest damage hypotheses. ORNL/TM - 9917, Oak Ridge National Laboratory, TN.

United States Department of Agriculture Forest Service Pacific Northwest Research Station General Technical Report, PNW-GTR-222, March 1989.

USDA handbook Number 701, "Landscape Aesthetics: A Handbook for Scenery Management"

USDA Forest Service. 1993. Southern Region. Final Revised Land and Resource Management Plan George Washington National Forest.

USDA Forest Service. 1993. Southern Region. Final Environmental Impact Statement for the George Washington National Forest Revised Plan.

USDA, Forest Service, Southern Region. 1997. Guidance for Conserving and Restoring Old-Growth Forest Communities on National Forests in the Southern Region. Report of the Region 8 Old-Growth Team. Forestry Report R8-FR 62. Atlanta, GA. 118pp.

USDA Forest Service. Information about Old Growth for Selected Forest Type Groups in the Eastern United States, General Technical Report NC-197.

- USDA Forest Service. George Washington and Jefferson National Forest. 2001. Detailed Monitoring and Evaluation Report, Fiscal Years 1999 and 2000.
- USDA Forest Service. 2004. Detailed Monitoring and Evaluation Report for the George Washington and Jefferson National Forests.
- USDA Forest Service. Federally Listed Fish and Mussel Conservation Plan.
- USDA Forest Service. 2004. USDA Forest Service Strategic Plan for Fiscal Years 2004-08. FS-810. 40 pp.
- USDA Forest Service et al. 2007. Wildland Fire Use Implementation Procedures Reference Guide. 75 pp.
http://www.nifc.gov/fire_policy/pdf/wildland_fire_use_guide.pdf
- USDI Fish and Wildlife Service. 2007. 50 CFR Part 17 Endangered and Threatened wildlife and plants; Removing the Bald Eagle in the Lower 48 State from the List of Endangered and Threatened Wildlife: Final Rule. Federal Register 72(130):37345-37372
- USGS Breeding Bird Survey Data for the Blue Ridge Region and Ridge Valley Region.
<Http://www.mbr-pwrc.usgs.gov/bbs>.
- USGS, 1999. *Soil-Calcium Depletion Linked to Acid Rain and Forest Growth in the Eastern United States*. US Department of Interior, Washington, D.C.
- Verry, E. 2000. Water flow in Soils and Streams: Sustaining Hydrologic Function, in Riparian Management in Forests of the Continental Eastern United States, edited by E. S. Verry, J. W. Hornbeck, and C.A. Dolloff. Lewis Publishers, CRC Press LLC, Washington D.C.
- Virginia Department of Game and Inland Fisheries. 2007. Virginia Deer Management Plan 2006-2015. Wildlife Information Publication No. 07-1.
<http://www.dgif.virginia.gov/wildlife/deer/>
- Virginia Department of Game and Inland Fisheries. 2005. Virginia's Wildlife Conservation Action Plan.
- Virginia Department of Game and Inland Fisheries. 2002. Virginia Black Bear Management Plan 2001-2010. <http://www.dgif.virginia.gov/wildlife/bear/>
- Virginian Department of Conservation and Recreation Natural Heritage Program
- Wells, C.G., Jorgensen, J.R., 1979, Effect of Intensive Harvesting on Nutrient Supply and Sustained Productivity, in Proceedings: Impact of Intensive Harvesting on Forest Nutrient Cycling, pages 212-230, pub. Syracuse, N.Y.: State University of New York, College of Environmental Science and Forestry, Conference paper.

Welsch, D., J. Hornbeck, E. Verry, C. A. Dolloff, and J. Greis. 2000. Riparian Area Management: Themes and Recommendations, in Riparian Management in Forests of the Continental Eastern United States, edited by E. S. Verry, J. W. Hornbeck, and C.A. Dolloff. Lewis Publishers, CRC Press LLC, Washington D.C.

Wenger, S. 1999. A Review of the Scientific Literature on Riparian Buffer Width, Extent, and Vegetation. Office of Public Service & Outreach, Institute of Ecology, University of Georgia, Athens. Revised version March 5.

West Virginia's Wildlife Conservation Action Plan.

White, E.H., Harvey, A.E., 1979, Modification of intensive management practices to protect forest nutrient cycles, Proceedings: Impact of intensive harvesting on forest nutrient cycling, 1979; 264-278, pub. Syracuse, N.Y.: State University of New York, College of Environmental Science and Forestry, Conference paper.

Williams, Charles E. 1998. History and status of Table Mountain pine-pitch pine forests of the southern Appalachian Mountains (USA). *Natural Areas Journal*. 18(1): 81-90.

Wilson, D.M. and V.J. Dicenzo. 2002. Profile of a trophy largemouth bass fishery in Briery Creek Lake, Virginia. Pages 583-592 in D. P. Philipp and M. S. Ridgway, editors. *Black Bass: Ecology, Conservation, and Management*. American Fisheries Society, S

Zaccherio, Meredith T. and Adrien C. Finzi, 2007, Atmospheric Deposition May Affect Northern Hardwood Forest Composition By Altering Soil Nutrient Supply, *Ecological Applications*, 17(7), 2007, pp. 1929–1941, 2007 by the Ecological Society of America.

<http://www.forestencyclopedia.net/>

<http://www.nativetreesociety.org/>

<http://vafwis.org/fwis/?Menu=Home.Visitor+Options>

<http://www.natureserve.org/>

http://www.dcr.virginia.gov/natural_heritage/nchome.shtml

<http://web.utk.edu/~grissino/>

<http://www.firescience.gov/>

<http://frames.nbii.gov/portal/server.pt>

<http://www.tncfire.org/>

<http://www.fs.fed.us/ne/delaware/4153/em/em.html#Top>

<http://web.utk.edu/~grissino/jfsp01C3309/publications.html>

<http://www.landfire.gov/>

<http://www.frcc.gov/>

http://www.fs.fed.us/r8/gwj/forestplan/revision/10-08-for-monitoring-page/2007_Appendix_C_Tables_By_Resource_Area.pdf

<http://www.natureserve.org/publications/usEcologicalsystems.jsp>

<http://www.natureserve.org/library/vol1.pdf>

<http://www.fs.fed.us/r8/gwj/forestplan/gwplandocs/feis.pdf>

<http://bewildvirginia.org/wildlifeplan/>

<http://www.dof.virginia.gov/resinfo/index-fia.shtml>

<http://www.srs.fs.fed.us/sustain/report/fire/fire.htm>

http://www.wildlifeactionplans.org/west_virginia.html

http://www.wildfirelessons.net/uploads/JFSP%20Summaries/98-1-4-09_final.doc